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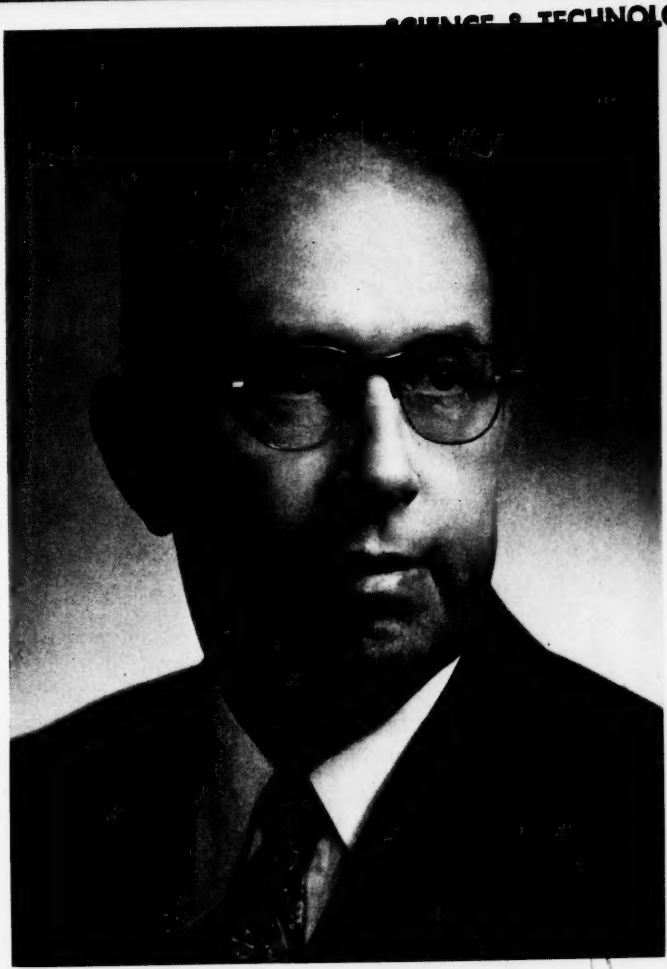

June 1959

Ray T. Bayless
American Society for Metals
(See Article, Page 4)

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Ray T. ("Doc") Bayless to Retire After 37 Years at A.S.M.

Ray T. Bayless, editor of the *Transactions* of the American Society for Metals, assistant secretary of the Society since 1930, and managing director since the death of W. H. Eisenman last May, will retire on Sept. 1, 1959, after 37 years of service and devotion to the Society.

In scientific circles, no person is better known than Ray T. Bayless. He has shepherded 37 separate Publications Committees (now known as Transactions Committees) through the ordeals of winnowing countless manuscripts down to an acceptable minimum, he has wheedled and coaxed and pampered authors to deliver their material on time and to remain his friend in the bargain. Hovering in the background at all conventions and technical sessions, from daybreak to midnight, he has been greatly responsible for running the meetings with clockwork precision and has never missed a national meeting in his 37 years with the Society.

Ray was named the first full-time editor of the *Transactions* of the American Society for Steel Treating in 1922 and still serves in that capacity for the *Transactions* of the American Society for Metals. He was the first full-time male employee to supplement the efforts of Secretary Bill Eisenman in assuaging the growing pains of the booming young technical Society.

His administrative and managerial talents, together with an infinite capacity for hard work at any chore assigned, made an invaluable combination in those early days, and in 1930, when the staff was augmented to nearly a dozen, he was made assistant secretary.

It was also in 1930 that *Metal Progress* and *Metals Review* were established, and Ray was named editor of the latter. Although the detailed work on this publication was done largely by the managing editor, Ray's editorial supervision was and has been maintained. In 1947 he was named publishing director of *Metals Review*.

Sprouting from the *Transactions*, the Society's publication program branched off in many directions. Educational sessions were and still are held during the week of the Metal Congress, and about midway of Ray's career the highly successful Saturday and Sunday seminars at the Metal Congress were initiated. Each of the seminars has since been edited and published. Such books attracted manuscripts from other authors and a large part of Ray's time, and overtime, was devoted to editing and seeing the books through to printed form. In so doing he acquired an intimate knowledge of printing and engraving which he has used to advantage in maintaining the highest possible level of printing quality in A.S.M. publications and in keeping up with new methods for economical, faster and better printing.

His duties as assistant secretary have included being office manager, purchasing director and the final voice in approving all invoices, bills and expense accounts before payment. He was also instrumental in obtaining the present A.S.M. offices that have served as national headquarters since 1940. He has, in addition, served continuously as secretary of the Publications, Transactions and Educational Committees, edited and supervised printing of the National and Western Metal Congress programs, plus numerous other details.

Mr. Bayless' meticulous attention to these widely varying activities and the knowledge he had thus gained in so many fields have earned him the title of "Doc", bestowed by his long-time and well-known secretary, Genevieve Fitzgerald, and Doc and Fitz made a happy team for many years.

Although he was born in Amityville, Long Island, Ray grew up in Detroit, and was graduated from the University of Michigan with a Bachelor of Science degree in Chemical Engineering. A taste for the metallurgical side of chemistry was nurtured by special work in metallurgy and metallography.

But, even more important in his college career was the fact that he met a pert little French girl, Norma deGuise, and in 1916 they were married. Their two sons and one daughter are now married and have jointly contributed nine grandchildren to participate in the family gatherings in their Shaker Heights home.

Ray did not go immediately from the University of Michigan to A.S.M., but furthered his metallurgical knowledge widely by short periods as assistant analytical chemist for the Michigan Smelting and Refining Co., assistant analytical chemist and metallurgist, General Motors Co., assistant chief chemist and metallurgist, Chalmers Motor Co., and chief chemist and metallurgist, Saxon Motor Car Co., all in Detroit. In 1917 he moved to Cleveland as supervisor of tests, U. S. Army Ordnance Dept., and then joined the James H. Herron Co. as consulting metallurgical engineer where he was until he found his life's work at A.S.M. in 1922.

In 1953 the University of Michigan presented its Distinguished Alumnus Award to Mr. Bayless in recognition of his outstanding contributions to the development of the field of engineering.

Knowing how completely a technical society depends on the volunteer work of its individual members, Doc was careful to contribute generously to other organizations. This month he was honored by the American Society for Testing Materials on completion of 40 years consecutive membership, during which he served on many committees as well as the Cleveland district chairman. He has been a member of the Society of Automotive Engineers for 36 years, and of the A.I.M.E. for 34 years. He has been a member of the Cleveland Engineering Society since 1930 and of the State of Ohio Professional Engineers Society since its beginning in 1933. If all of these association activities were added to his A.S.M. membership, he could boast of 205 man-years of technical society membership.

Despite his devotion to duty, Doc does not hold to an "all work and no play" philosophy. He is a keen sportsman and a world traveler. He is also an expert rifleman and has won many medals and trophy matches at national, state and local competitions. In 1935 and 1939 he fired as a member of the Ohio State Civilian Rifle Team in the National Matches at Camp Perry, Ohio. For six years he was a national director of the National Rifle Association. Both he and his wife are extremely fond of travel and they have visited South America and Hawaii in addition to two trips to Europe where they poked around in some of the more out-of-the-way countries. He has traveled widely in the U. S., Canada and Mexico, and attended a number of the international conventions of the Rotary Club.

A third ingredient, however, must enter into every life to temper the joys of hard work and well-earned recreation. For Ray it was not grief or sorrow, but pain—the almost unbearable pain of recurring attacks of tic douloureux. Despite his efforts over the years to disregard the increasing severity of the illness, the time finally came when surgery was imperative. Recurrences have re-

(*Continued on p. 5*)

Reports on Metals As Materials

John H. Hollomon, National Trustee A.S.M., and Manager, Metallurgy and Ceramics Research Dept., Research Laboratory, General Electric Co., Reported on "Metals as Materials" at a Meeting in Boston. Shown are, from left: M. Cohen, Massachusetts Institute of Technology; Dr. Hollomon; Past National President John Chipman, Massachusetts Institute of Technology; and R. Pomfret, chairman. (Photograph by H. L. Phillips)

Speaker: J. H. Hollomon
General Electric Co.

John H. Hollomon, national trustee A.S.M., and manager, Metallurgy and Ceramics Research Dept., Research Laboratory, General Electric Co., gave a talk entitled "Metals as Materials" at the National Officers' Night meeting of the **Boston Chapter.**

Dr. Hollomon gave a brief report of the status of A.S.M. and, in particular, indicated a new spirit is needed if the Society is to continue its growth during the next several decades. He indicated that this growth could well take place by the expansion of interests of metallurgists to the other kinds of materials that are important to the economy of our current industrial society. He compared the position of metallurgy in the United States with that of the Soviet Union indicating that, in general, the comparative state of Soviet industrial development was some 20 to 30 years behind ours. This was not to indicate that they do not have good science and engineering, but only that they were just beginning to build their basic industries and they have not as yet met the same kinds of problems that we face.

Dr. Hollomon then discussed the behavior of materials, comparing it with the behavior of ceramics, glass and polymers, pointing out that the same principles govern their behavior. Structure controls the properties in the same way and the same chemistry controls their refining and their purification.

There are today many more people in the industries that consume materials interested in metals and materials than there are in those companies that produce the materials. Heretofore, the emphasis, naturally, was on the extraction of materials from naturally occurring ores and raw sources to permit their use in already developed applications. Today the major emphasis is on the development and improvement of new materials and synthetic substitutes for materials not so readily available.

Materials engineering is already more important than metallurgical engineering in many industries and Dr. Hollomon believes that this field will continue to grow. He emphasized that materials science is not the same as solid state physics and that there is a role for the metallurgist in the development of the science of materials, because the metallurgist already appreciates better than anyone else the relationship between structure and properties so important to understanding complicated materials.

Dr. Hollomon reviewed developments in materials that have occurred since 1945 and discussed how they took place. He indicated that basic solid state physics is involved in only a few cases and that the developments are largely a result of the application of physical chemistry and mechanics long known to the materials scientists and engineer.

This new view of materials and the rapid application of the science involved to practical application are vital to the development of modern industry and perhaps even to our race with Russia for world industrial and economic domination.—**Reported by Stephen G. Demirjian for Boston Chapter.**

"Doc" Bayless (continued)

quired two additional trips to the hospital, but the cure has been pronounced as complete now by his doctor.

This last attack came during the year of Doc's greatest responsibility. After the death of Bill Eisenman last May, he was asked by the Board of Trustees to take over the reins as acting managing director of the Society until the necessary revisions were made in the A.S.M. Constitution to allow the appointment of a full-time person to this position. This has now been done. And, on Sept. 1, 1959, Ray T. Bayless will retire from active direction of the affairs of the American Society for Metals. Those who know him know that he will never retire in spirit and the influence of his many years at A.S.M. will always be felt.

Award Ohio State Student at Columbus

Shown Being Presented an A.S.M. Scholarship at a Meeting Held by Columbus Chapter Is John Thomas Cammett, Freshman at Ohio State University (Center). On the left is Mars G. Fontana, head of the department of metallurgical engineering; on right is T. L. Chase, chairman

"Intra-Forming of Metals" Was the Topic Discussed by Rex McMillan, Cincinnati Milling Machine Co., Meta-Dynamics Division, at a Meeting Held by the Montreal Chapter. Shown are, from left: Rafe Sherwin, chapter councillor; Mr. McMillan; and R. Thompson, chairman of the Chapter

Describes Intra-Forming Technique

Speaker: Rex McMillan

Cincinnati Milling Machine Co.

Rex McMillan of the Cincinnati Milling Machine Co., Meta-Dynamics Division, spoke on "Intra-Forming of Metals" at a meeting in **Montreal.**

Intra-forming was described as a development in chipless machining in which the intra-form machine forms profiles quickly and accurately on the inside diameter of cylindrical workpieces without the need of expensive tooling.

The intra-form employs a set of four forming dies which pulsate rapidly while revolving around the outside diameter of the workpiece. Cam-mounted dies are made to pulsate through contact with a series of steel rollers in a raceway. The pulsating action is due to the cams passing from one roller to the next in the form of a sine curve thus making the die pulsate. The rotating cams never lose contact with the rollers and so a vibrationless, relatively noiseless, squeezing action results. The rapidly pulsating dies (1000 times per min.) squeeze cylindrical stock which feeds over a short nonfeeding mandrel. When the operation is complete, the profile of the mandrel has been reproduced on the ID of the part.

Intra-form cold forms both nonferrous and ferrous alloy workpieces ranging in diameter from ⅛ to 5 in. Workpieces can be pre-machined blanks, tubing, castings, forgings or extrusions. Typical applications are trim dies, ratchets, sockets, rifle barrels and heat exchanger finned tubing. All these applications require the use of a mandrel. Other products, such as laminated tubing (aluminum-to-copper) can be made on the machine without a mandrel.

Among many advantages of the intra-form method are the ability of the machine to produce parts which would be difficult or time-consuming to produce by conventional methods; to produce close tolerances such as an over-all limit on ID of 0.0002 in.; to produce excellent surface finish; to improve physical properties of the worked material by increasing hardness and tensile strength; to add greatly to fatigue life of the part by producing continuous flow lines; and to be tooled relatively simply and inexpensively thus allowing short production runs and developmental work. **—Reported by H. H. Mays for Montreal Chapter.**

Discusses Challenge of Space Age

W. H. Steurer, Chief of Engineering Materials, Convair, Spoke on "Rockets and Spaceships" at Rochester Chapter. Shown are, from left: M. Finch, chairman; Dr. Steurer; and Ted Spangel, Industrial Management Council

Speaker: W. H. Steurer

Convair

"Rockets and Spaceships—Their Development and Their Metallurgical Problems" was the topic discussed by Wolfgang H. Steurer, chief of engineering materials, Convair, at a meeting of **Rochester Chapter.**

Man has always been an explorer and the time for search into space is at hand. Will we be the pioneers or are we to sit idly by and observe the successes of another country? The problems of space travel are many and varied. Dr. Steurer proceeded step by step to define some of the problems.

The metallurgist is beset in finding new materials to overcome the unprecedented operational and environmental conditions. Aerodynamic heating is the main problem. The extremely high temperatures encountered during the re-entry maneuver swiftly melt and vaporize metallic and nonmetallic materials.

Entirely new concepts were evolved because of the extremely short time of re-entry wherein materials assume a functional role in the absorption of heat. Cooling can be applied in the combustion chamber but the skin temperature has no easy means of cooling. Consequently it was found that metastable materials for strength and an artificial skin material of ceramic and metal could be used for the short-time re-entry maneuver.

Dr. Steurer stated that today the ionic spaceship is considered the most practical means of locomotion and that it will have to be built in space.

In conclusion he said that the space age is the greatest event in mankind's history. Man has widened his horizons so space travel must be conquered. Quality will replace quantity in materials as well as in education. The challenge of the great unknown is needed for the younger generation and it is upon their shoulders that the future of mankind rests.—**Reported by Joseph V. Hurley for Rochester.**

Quarterly preprint list

Papers for Presentation at the National Metal Congress Chicago, Nov. 2-6, 1959

All of the following papers will be preprinted for distribution to members of the American Society for Metals upon request. The Society will print only 10% in excess of the number of orders for preprints in the office on press date, and this excess 10% will be sent out as long as it lasts. Order the preprints by their numbers before Sept. 1, 1959.

Preprints No. 142, 145, 146, 156, 157, 158 and 166 (marked by asterisks) are for publication only in Transactions, all of the other papers listed will be presented at the National Metal Congress. All of the papers listed will be included in vol. 52 (1959) of Transactions.

137. **Effect of Stress on the Creep of Aluminum in the Dislocation Climb Range,** by A. Bayce, W. D. Ludemann, L. A. Shepard and J. E. Dorn, Institute of Engineering Research, University of California, Berkeley, Calif.

138. **The Effect of Small Columbium Additions to Semi-killed, Medium-Carbon Steels,** by C. A. Beiser, Product Development Laboratory, Union Carbide Metals Co., Niagara Falls, N. Y.

139. **The Thermal and Electrical Conductivities of Ductile Cast Iron and Several Gray Cast Irons,** by J. H. Brophy, Massachusetts Institute of Technology, Cambridge, Mass., and M. J. Sinnott, University of Michigan, Ann Arbor, Mich.

140. **Tensile Properties of Copper-Bearing Low-Carbon Steel,** by G. W. Bush, Pennsylvania State University, University Park, Pa., and R. W. Lindsay, Central Research Laboratory, Crucible Steel Co. of America, Pittsburgh, Pa.

141. **On the Aging Behavior of the Alloy Ti-6Al-4V,** by J. M. Dupouy, M. B. Bever and B. L. Averbach, Dept. of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

142.* **Investigation of the Thorium-Yttrium System,** by D. T. Eash and O. N. Carlson, Institute for Atomic Research, Iowa State College, Ames, Iowa.

143. **Columbium-Oxygen System,** by Rodney P. Elliott, Armour Research Foundation of Illinois Institute of Technology, Chicago, Ill.

144. **Anomalous Effect of Hydrogen on the Mechanical Properties of Ti-8Mn Alloy,** by Albert H. Fleitman, Engineering Div., Crane Co., Chicago, Ill.

145.* **Compatibility of a Number of Metals and Alloys With Graphite,** by Arnold F. Gerds and Manley W. Mallett, Ferrous Metallurgy Div., Battelle Memorial Institute, Columbus, Ohio.

146.* **The Yttrium-Magnesium Alloy System,** by E. D. Gibson and O. N. Carlson, Institute for Atomic Research, Iowa State College, Ames, Iowa.

147. **Kinetics of Decomposition of Alpha Prime in a Titanium-Copper Alloy,** by Mario P. Gomez, Boeing Airplane Co., Renton, Wash., and D. H. Polonis, University of Washington, Seattle, Wash.

148. **Metallographic Study of Stringers in Inert Atmosphere-Melted Zircaloy-2,** by J. D. Grozier, L. S. Rubenstein and J. G. Goodwin, Core Engineering Dept., Westinghouse Electric Corp., Pittsburgh, Pa.

149. **Calculation of Rolling Forces Using the Orowan Theory,** by John E. Hockett, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.

150. **Gas-Metal Reactions During Box Annealing of Low-Carbon Steel,** by R. M. Hudson and G. L. Stragand, Applied Research Laboratory, U. S. Steel Corp., Monroeville, Pa.

151. **Correlation Between Internal Friction and Temper Brittleness in Steel,** by Abdul-Fattah K. Kaddou and P. C. Rosenthal, College of Engineering, University of Wisconsin, Madison 6, Wis.

152. **Effect of Cold Work on Temper Brittleness,** by A. S. Keh and W. C. Porr, Edgar C. Bain Laboratory for Fundamental Research, U. S. Steel Corp., Monroeville, Pa.

153. **The Effect of Rolling Variables on the Hot Rolling of Titanium and Titanium Alloys,** by Frank R. Larson and John Nunes, Ordnance Corps, Watertown Arsenal, Watertown, Mass.

154. **The Dimensional Stability of a Precision Ball Bearing Material,** by E. B. Mikus, Convair Astronautics, Engineering Materials Group, San Diego, Calif., and J. M. Gerty, T. J. Hughel and A. C. Knudsen, General Motors Technical Center, Warren, Mich.

155. **Experimental Survey of the Deformation of the Hard-Ductile Two-Phase Alloy System WC-Co,** by C. Nishimatsu and J. Gurland, Div. of Engineering, Brown Univeristy, Providence, R. I.

156.* **The System Titanium-Bismuth,** by I. Obinata and Y. Takeuchi, Research Institute for Iron, Steel and Other Metals, Tohoku University, Sendai, Japan, and S. Saikawa, Furukawa Electric Co., Tokyo, Japan.

157.* **The System Titanium-Calcium,** by I. Obinata and Y. Takeuchi, Research Institute for Iron, Steel and other Metals, Tohoku University, Sendai, Japan, and S. Saikawa, Furukawa Electric Co., Tokyo, Japan.

158.* **The Uranium-Hafnium Equilibrium System,** by David T. Peterson, Iowa State College, Ames, Iowa, and D. J. Beerntsen, Research Laboratories, Allis Chalmers Manufacturing Co., Milwaukee, Wis.

159. **Diffusion of Oxygen in Alpha and Beta Titanium,** by William P. Roe, American Smelting & Refining Research Laboratories, South Plainfield, N. J., Howard R. Palmer, Titanium Metals Corp. of America, Henderson, Nev., and W. R. Opie, Titanium Div., Research Laboratory, National Lead Co., South Amboy, N. J.

160. **Structure and Properties of Austenitic Alloys Containing Aluminum and Silicon,** by Duane J. Schmatz, Physical Metallurgy Section, Ford Motor Co., Dearborn, Mich.

161. **The High-Temperature Oxidation of Tungsten-Columbium Alloys,** by J. W. Semmel, Applied Research Operation FPD Flight Propulsion Laboratory Dept., General Electric Co., Cincinnati, Ohio.

162. **The Tensile and Yield Strength of Cr-Mn-N Steels at Low Temperatures,** by J. C. Shyne, F. W. Schaller and V. F. Zackay, Physical Metallurgy Section, Ford Motor Co., Dearborn, Mich.

163. **The Strength of Martensite Formed From Cold Worked Austenite,** by J. C. Shyne, V. F. Zackay and D. J. Schmatz, Physical Metallurgy Section, Ford Motor Co., Dearborn, Mich.

164. **Properties of Refractory Alloys Containing Rhenium,** by Chester T. Sims, Knolls Atomic Power Laboratory, General Electric Co., Schenectady, N. Y., and Robert I. Jaffee, Battelle Memorial Institute, Columbus, Ohio.

165. **The Corrosion Behavior of Titanium-Palladium Alloy,** by Milton Stern and Claude R. Bishop, Metals Research Laboratories, Union Carbide Metals Co., Niagara Falls, N. Y.

166.* **The System Zirconium-Iron-Tin,** by L. E. Tanner and D. W. Levinson, Metals Research Div., Armour Research Foundation of Illinois Institute of Technology, Chicago, Ill.

167. **Some Metallurgical Factors Affecting Stress Corrosion Cracking of Austenitic Stainless Steels,** by H. H. Uhlig, Dept. of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., and R. A. White, Standard Oil Co. of Calif., San Francisco, Calif.

168. **Directional Grain Structures for High-Temperature Strength,** by F. L. VerSnyder and R. W. Guard, Research Laboratory, General Electric Co., Schenectady, N. Y.

169. **High-Strength Zirconium Alloys,** by R. K. Wagner and H. E. Kline, Fuel Element Development, Atomics International, Canoga Park, Calif.

170. **The Effect of Initial Increments of Hot Working on the Mechanical Properties of Certain Ferrous Materials,** by H. J. Wagner, Battelle Memorial Institute, Columbus, Ohio, and J. W. Spretnak, Dept. of Metallurgical Engineering, Ohio State University, Columbus, Ohio.

171. **Substructure Characteristics of Fine-Grained Metals and Alloys Disclosed by X-Ray Reflection Microscopy and Diffraction Analysis,** by S. Weissmann, Rutgers University, Bureau of Engineering Research, New Brunswick, N. J.

172. **The Effect of Austenitizing, Tempering and Microstructure on the Properties of a Cr-Mo-V Steel,** by F. E. Werner, T. W. Eichelberger and E. K. Hann, Research Laboratories, Westinghouse Electric Corp., Pittsburgh, Pa.

173. **The Influence of Pre-Existing Sharp Cracks on Brittle Fracture of a Ni-Mo-V Forging Steel,** by E. T. Wessel, Research Laboratories, Westinghouse Electric Corp., Pittsburgh, Pa.

174. **The Importance of Directionality in Drawing Quality Sheet Steel,** by R. L. Whiteley, Physical Metallurgy Div., Bethlehem Steel Co., Bethlehem, Pa.

175. **An Investigation of Aluminum-Copper Composites Prepared by Solid-State Bonding,** by J. M. Williams, Moderator Materials Development, Aircraft Nuclear Propulsion Dept., General Electric Co., and M. B. Bever, Dept. of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

176. **Supersaturation as a Factor in the Hydrogen Embrittlement of Titanium Alloys,** by D. N. Williams, F. R. Schwartzberg and R. I. Jaffee, Battelle Memorial Institute, Columbus, Ohio.

177. **Transformation Kinetics and Mechanical Properties of Uranium-0.5 w/o Columbium-0.5 w/o Molybdenum Alloy,** by E. G. Zukas, Los Alamos Scientific Laboratory, University of California, Los Alamos, N. Mex.

Gas Turbine Metallurgy Is Subject at Chattanooga

Speaker: Robert Downey
General Electric Co.

Members of the **Chattanooga Chapter** heard a talk on "Gas Turbine Metallurgy" by Robert Downey, General Electric Co.

The metallurgist working in the field of gas turbines has the problem of always finding new materials to satisfy an incessant demand for higher temperatures and lighter weights in a field that is moving rapidly forward. In the selection of materials for jets, some of the criteria are: elevated temperature, strength, fatigue properties, modulus of elasticity, thermal expansion, fabricability, availability, cost and a comparison of the strength-to-weight ratio of the various materials. Up to about 1200° F. the iron-base alloys have generally proven best, while above this temperature nickel-base alloys usually have excelled for turbojet applications.

The most critical section of a turbojet engine in the selection of materials is the turbine. For the critical turbine bucket and turbine nozzle blade applications, metallurgical developments have seen the replacement of cobalt-base alloys, which operate at 1500° F., with nickel-base alloys which can operate over 200° F. hotter. Similarly, in the compressor section, iron alloys have taken the place of magnesium and aluminum alloys because of their greater strength and higher permissible operating temperatures.

Often the gas turbine metallugist is forced to develop new alloys for demanding jobs even before the commercial metal producers do. After the development of a new material it must be produced commercially and studied for its ability to be fabricated. New processes, such as vacuum melting, have improved existing materials and continuing studies have demonstrated that processing techniques once thought of little value for jet engine parts can be improved to such an extent that they actually are preferable to those traditionally used. An example of this is the use of cast materials for turbine buckets whereby better high temperature strength is achieved than is possible with wrought alloys.

The future of gas turbine metallurgy looks to improvements in presently used material types, followed by exploitation of the refractory metals as temperatures go higher.—**Reported by J. H. McMinn for Chattanooga Chapter.**

Walter Crafts *W. A. Pennington* *R. J. Raudebaugh* *C. H. Samans* *A. R. Fairchild*

National Officer Nominations 1959-1960

NOMINATIONS for new national officers of the American Society for Metals have been announced by the Nominating Committee, which met in Chicago on May 19, under the chairmanship of Charles K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala.

Walter Crafts, currently serving as vice-president, was nominated for president, W. A. Pennington was nominated for vice-president, and R. J. Raudebaugh was selected as nominee for treasurer.

Two additions were proposed for the Board of Trustees, Carl H. Samans and Albert R. Fairchild.

In accordance with the Constitution of the American Society for Metals, additional nominations for any of these posts may be made by written communications addressed to the secretary of the Society and signed by any 50 members. If no such additional nominations are received prior to July 15, nominations shall be closed and at the annual meeting in November 1959 the secretary will cast the unanimous vote for the members for these candidates.

Walter Crafts

Walter Crafts, selected as nominee for president, is associate director of research, Metals Research Laboratories, Electro Metallurgical Co. Mr. Crafts graduated from Yale University in 1924 and received his M.S. degree from Massachusetts Institute of Technology in 1926. He was employed at the Illinois Steel Co. from 1926 to 1929 and since that time has been engaged in research on alloy steels at Union Carbide and Carbon Research Laboratories in the Electro Metallurgical Division at Niagara Falls, N. Y.

Among the research projects he has handled has been the development of various alloy addition agents used in making steel and cast iron. His work on steelmaking and deoxidation, as well as on the hardenability and properties of alloy steels, has been described in many papers presented before A.S.M. and A.I.M.E. groups. He is co-author of two books, "Hardenability and Steel Selection" and Alloys of Iron and Chromium".

Mr. Crafts was a national trustee A.S.M. from 1953 to 1955. He has been a member of the Nominating Committee and the Handbook Committee. He was chairman of the Buffalo Chapter in 1942-1943 and has served on the A.S.M. Publications Committee, both as a member and as chairman (1947).

W. A. Pennington

W. A. Pennington, selected as nominee for vice-president, is in the Department of Metallurgy, University of Maryland, College Park. He was national treasurer A.S.M. from 1953 to 1955.

Dr. Pennington received his Ph.D. degree from Iowa State College and served as head of the department of mathematics at Union College, later joining American Rolling Mill Co. as a research engineer. After some time at the Mellon Institute as an industrial fellow, he left to take a position as chief chemist and metallurgist at Carrier Corp., Syracuse, N. Y.

Dr. Pennington has long been an active participant in A.S.M. affairs including membership on the Society's Publications Committee. He was awarded the Henry Marion Howe Medal in 1947.

R. J. Raudebaugh

The nominee for treasurer, Robert J. Raudebaugh, is with the Research Laboratories, International Nickel Co., Bayonne, N. J. A native of Ohio, Dr. Raudebaugh received a B.S. degree in chemical engineering in 1932 from Carnegie Institute of Technology. He was awarded his Ph.D. degree in physical metallurgy by Purdue University in 1945. He spent six years at Armco Steel Corp. doing research, and during the summer months of 1950 he was a member of the Metallurgical Division at Oak Ridge National Laboratory. He also spent a short time in 1952 in the Research Laboratories for International Nickel Co. From 1939 to 1944 he was an instructor in physical metallurgy at Purdue and from 1944 to 1948 was in charge of graduate and undergraduate work in metallurgical engineering at University of Rochester. In 1948 he took a position as professor of metallurgical engineering and in 1952 was made acting director of the School of Chem-

(*Continued on p.* 10)

Tours Northwest Chapters

Walter Hibbard, General Electric Co., Who Spoke on "Russian Metallurgy" Before the Pacific Northwest Chapters A.S.M., Is Shown (Left) With Larry Chockie, Chairman of the Columbia Basin Chapter, Which Was His First Stop on the Swing Around the Chapters

Powder Metals Is Topic

Gregory J. Comstock (Right), Professor of Powder Metallurgy, Stevens Institute of Technology, Who Gave a Talk on "Producing New Types of Metals and Powders for Sintering" at a Meeting in New Haven Is Shown With Technical Chairman John D. Berwick

Speaker: W. R. Hibbard

General Electric Co.

Walter R. Hibbard, manager, Alloys Studies Section, General Electric Co. Research Laboratory, delivered a series of talks before the **Pacific Northwest Chapters** on "The Russians and Their Metallurgical Progress". He illustrated his talk with colored slides taken during a State Department sponsored tour of Russia last year.

Actually, Dr. Hibbard stated, the Russians make "no bones" about their intention of surpassing us in the field of metallurgy—they come right out and say they will. And in this respect it is Dr. Hibbard's opinion that they present a real challenge to U. S. metallurgists. The Russian effort is tremendous. There is no single effort in the U. S. comparable to Russian government-sponsored activities in money, facilities, numbers of people and centralized planning. The individual efforts in the U. S. are smaller and more diverse—the Russian effort is all-inclusive under the government, industry and Academy of Science.

The steel industry in Russia locates its plants and facilities at the source of the ore rather than close to markets for its products. This reflects a smaller interest in marketing considerations since the primary concern is production. Costs are also secondary; consequently Russian industries tend to overstaff since compensation is entirely based on production quotas. The result is to reduce or eliminate internal economic competition. Incentives are reserved for production achievements. Research and development are not carried out in the production plant but are left largely to the Academy of Science (governmental research) and the Gosplan (industrial research).

The institutions of the Academy of Science are well staffed, well financed and extensively equipped. The metallurgists, both men and women (approximately 40% are women) are thoroughly familiar with the technical literature in their fields, both Russian and foreign.

Dr. Hibbard concluded that the Russians are definitely a challenge but one we should prepare to meet by utilizing our own system to the best advantage.—**Reported by Evan Baker, Columbia Basin, for Inland Empire, Vancouver Island and British Columbia Chapter.**

National Officer Nominations, 1959-1960

(*continued from p. 9*)

ical Engineering, Georgia Institute of Technology.

Dr. Raudebaugh has been a member of the Rochester, Cincinnati, Indianapolis, Georgia and New Jersey Chapters, having served on the executive committee and educational and program committees for some of the chapters. He is the author of the book "Nonferrous Physical Metallurgy" published by Pitman Publishing Co. in 1952.

C. H. Samans

Carl H. Samans, nominee for national trustee, was born in Greenville, Pa., and received most of his schooling in Philadelphia. He graduated from Rensselaer Polytechnic Institute with the degree of chemical engineer in 1929 and went to work in the research laboratory at Chase Brass & Copper Co. During the next five years, while still with Chase, he earned both his M.S. and Ph.D. degrees in metallurgy at Yale University. The next eight years he taught metallurgy at Lehigh, Rensselaer and Penn State. From 1941 to 1949 he was in the research department of American Optical Co., except for a period during the war when he was with the Conservation Division, War Production Board. Early in 1949 he accepted his present position as associate director of the engineering research department, Standard Oil Co. (Indiana).

Dr. Samans has served on the A.S.M. Publications Committee and has several articles in the Metals Handbook. He is the author of the textbook, "Engineering Metals and Their Alloys".

A. R. Fairchild

A. R. Fairchild, nominee for national trustee, a native of Spokane, Wash., received his B.A. degree in business administration from Duke University, and took several courses in various metallurgical subjects, including heat treatment, metallography and crystal structure, at Temple University and University of Pennsylvania.

Presently senior staff engineer at Western Electric Co., Al has worked as plant superintendent at Metlab Co., metallurgist and foreman of the heat treating and tool forging shop, New York Shipbuilding Corp., and with Standard Pressed Steel Co. and Midvale Steel Co. He was active in Philadelphia Chapter activities, having served on several committees, and was a conferee with the 1st World Metallurgical Congress in 1951. From 1952 to the present he has devoted much time and energy to Carolinas Chapter activities, having served on various committees, as chairman of the 1956 Southern Metals Congress and as a conferee in the 2nd World Metallurgical Congress. In addition, he encouraged the break-off from the Carolinas Chapter of the Savannah River and the Old South Chapters, conducting the organizational meeting of the latter. He also assisted in the formation of the Columbia (S.C.) Chapter.

Mr. Fairchild is a member of several technical societies, and is very active in social and community activities. He is the author of several technical papers published in technical journals.

Explains Adhesive Bonding for the B-58

E. R. Weiker, Who Spoke on "Adhesive Bonding for the B-58 Airplane" at a Meeting of the Philadelphia Chapter, Is Shown, Right Front, During the Question and Answer Period Following His Interesting Technical Talk

Speaker: E. R. Weiker

Convair Div.
General Dynamics Corp.

"Adhesive Bonding for the B-58 Airplane" was discussed at a meeting of the **Philadelphia Chapter** by E. R. Weiker, chief of process control, Convair Div., General Dynamics Corp. Slides were used to illustrate the talk.

The speaker discussed the performance advantages of the B-58 bomber with its speed of mach-2 and its high efficiency because adhesive bonded construction reduced its size and weight. He pointed out that this construction is highly favorable to aerodynamic smoothness and flight efficiency.

Various construction practices are used including the assembly of beaded metal panels with honeycomb fiberglass cores impregnated with resin and utilizing epoxy-phenolic adhesives for bonding the subassemblies in presses subject to curing temperatures. Other lamination assemblies are joined with a dry film adhesive consisting of nitrile rubber phenolic.

Assemblies must be bonded uniformly to meet 2000 psi. minimum temperature range —67 to 260° F.

In the final assembly operation the beaded panel subassemblies are generally riveted together. The wing assembly to the fuselage is more complex and involves joining to the fuselage structure with titanium bolts.

The testing of the bonded assemblies to insure uniformity of adhesive distribution and strength of the bond is very important and the technique of detecting and correcting for inadequacies is highly developed.—**Reported by N. J. Petrella for Philadelphia Chapter.**

Application of Metals in Atomic Reactors Topic at Southeast Ohio Meeting

Speaker: W. D. Manly

Oak Ridge National Laboratory

The first annual Students' Night Meeting of the **Southeast Ohio Chapter** attracted over 60 members and guests. The invited guests included 14 outstanding high-school students from Cambridge, New Concord, Zanesville, Coshocton, West Lafayette and Beverly, Ohio, and one student each from Marietta College and the University of Notre Dame.

W. D. Manly, associate director, Metallurgy Division, Oak Ridge National Laboratory, discussed the "Application of Metals in Atomic Reactors". His talk was enlivened by several humorous analogies and anecdotes which added interest and helped to clarify the theory behind nuclear reactors.

Mr. Manly traced the development of atomic reactors, starting with the discovery of radioactivity about 60 years ago, the establishment of the first chain reaction in 1942, and improvements in nuclear technology up to the present time. The importance of atomic energy becomes evident when one considers that world energy consumption has increased greatly during recent years. Future energy requirements can best be met by utilizing nuclear reactors because the total energy in the known uranium deposits is about three times as great as in all known coal deposits. Atomic fuels such as uranium produce several million times as much energy per pound as coal or oil.

Dr. Manly described the construction of the Oak Ridge research reactor which was built in 1943 and is still operating. Many improvements since then have resulted in smaller, more powerful and more efficient reactors. Metals can be used for all essential parts of nuclear reactors—uranium, plutonium and thorium are suitable for fuel, sodium is used as a coolant, beryllium serves as a moderator. Numerous metals may be used for shielding but lead is preferred because of lower cost. Boron or boron carbide is commonly used for control.

Much additional experimental and development work is needed not only so that we can build atomic submarines and planes but primarily so that we can extract nuclear energy more efficiently and economically. This is essential if our standard of living is to continue improving and this presents a challenge to the youth of today.—**Reported by H. W. Rathmann for Southeast Ohio.**

Indianapolis Hears Past President

Shown at the National Officers Night Meeting of the Indianapolis Chapter Are, From Left: J. E. Mitchell, Treasurer; G. M. Young, Immediate Past President A.S.M., Who Spoke on "Aluminum Alloy Development"; Carl E. Weber, Chairman; and Glenn F. Whiteley, Reception Chairman

Cites Effect of Radiation on Metals

M. S. Wechsler (Right), Solid State Division, Oak Ridge National Laboratory, Who Spoke on the "Effect of Radiation on Metals and Alloys" at Oak Ridge, Is Shown With J. O. Betterton, Jr., Technical Chairman

Speaker: M. S. Wechsler
Oak Ridge National Laboratory

Members of the **Oak Ridge Chapter** heard M. S. Wechsler of the Oak Ridge National Laboratory's Solid State Division speak on the "Effect of Radiation on Metals and Alloys".

Dr. Wechsler described the importance of lattice defects in determining the properties of metals and alloys. The nature of point defects, such as vacancies and interstitials, was illustrated with slides.

Using copper as an example, the speaker pointed out how fast neutrons collide with the atoms of the metal to create primary knock-ons. He emphasized with the aid of equations that the primary knock-on initially loses energy by ionization but, when its energy becomes less than a critical value ($\approx$0.06 Mev in copper), displacements are produced. The number of displacements (vacancies and interstitials) increases as the ion energy degrades toward the minimum energy necessary to cause a displacement (about 25 ev.) Although the theoretical number of displacements thus produced per primary knock-on is approximately 1000, experimental values are observed to be only 1/10th or 1/20th of this, due to radiation annealing, even at 10° K.

The effect of neutron irradiation on Young's modulus, internal friction, the critical shear stress and electrical resistance was discussed. The effect on internal friction was vividly illustrated with two copper tuning forks, one irradiated and one not. The fork that had been exposed in the Oak Ridge National Laboratory graphite reactor for about one week rang clearly when struck, thus indicating that its internal friction was sharply reduced by the irradiation treatment.

All of Dr. Wechsler's discussion centered on pure annealed materials. For the case of alloys, the idea was developed that alloys are frequently in a nonequilibrium state at room temperature and service temperatures. This arises from the fact that optimum properties are developed by allowing a diffusion-controlled reaction, such as precipitation and ordering, to occur to a critical extent at an elevated temperature. The alloy is then quickly returned to room temperature where properties are relied upon to be stable. However, when alloys are irradiated, the possibility exists that diffusion is enhanced because of the defects produced, and therefore a return to the equilibrium configuration may take place at lower temperatures than is normally the case. This idea was illustrated with the results of experiments on Cu-Al and Ni-Be, where it was shown that reactions occur more rapidly when the alloys are irradiated.—**Reported by A. Goldman for Oak Ridge.**

High-Temperature Compression Behavior Discussed at Purdue

Speaker: L. A. Yerkovich
Cornell Aeronautical Laboratory

Luke A. Yerkovich, research metallurgist, Cornell Aeronautical Laboratory, Cornell University, spoke on "High-Temperature Compression Behavior of Metals" at a meeting of **Purdue Chapter.**

The ultimate aim in any structural design is stability against plastic deformation. In the area of mechanical testing of metals, the tension test is used almost universally to describe load-carrying capacity. There is no doubt that the tensile test is an extremely valuable tool to express certain capabilities of metals, but data so obtained are very often misapplied in practice. It is usually and incorrectly assumed that metals are equally strong in tension and compression, or if differences exist they are stronger in compression. This general belief coupled with the inherent difficulty in conducting compression tests has been a major factor in the slow development of compression testing.

Mr. Yerkovich pointed out there is sufficient evidence to show that tension and compression characteristics cannot always be used interchangeably. This is especially true in defining the mechanical properties of structural steel alloys which are designed to be stressed in compression. The airframe industry has recognized the necessity of determining compressive properties to insure structural stability.

Many examples of the different tension and compression stress-strain properties of metals were shown by slides. A 2024-T3 aluminum alloy, for instance, was solution treated and cold processed in a straightening operation. The cold work following heat treatment resulted in an approximately 20% reduction in the 0.2% yield in comparison when compared with the companion tensile yield. Variations of tension-compression behaviors of metals are usually not so exaggerated at high temperatures. At 600° F. the 2024-T3 alloy showed only 5% variation.

Residual stresses within the grains of a processed metal are believed responsible for the stress-strain variations generally observed. This phenomenon, known as the "Bauschinger effect", simply states that if a metal is plastically stretched, its yield in the direction of deformation will be higher in tension than in compression. Cold worked or drawn bars as well as structural sheet alloys experience variations in the tension-compression properties.

The success of a compression test, which requires considerably more care than a tensile test, depends largely on the size of the testing machine, its ability to apply and maintain axial loads, and the precision with which the test specimens are prepared. For unrestrained specimens, recommended procedures state that the specimen should have a length to diameter ratio of not more than 3. A subpress which houses a thin alloy sheet specimen is often necessary.

The compression test appears well suited for assessing the properties of the relatively brittle cermet materials, and is a valuable method in determining the high-temperature compression - creep characteristics of structural alloys.—**Reported by J. D. Clyne for Purdue.**

A. S. M. has produced and makes available for showing before chapters and educational institutions moving picture films pertaining to metals.

Surveys Accomplishments Of Army Teams in the Guided Missile Age

Speaker: C. G. Patterson

Redstone Arsenal

Colonel C. G. Patterson, U. S. Army Ordnance Missile Command, Redstone Arsenal, Ala., spoke at **Pittsburgh** on "The Guided Missile Age".

Col. Patterson explained what a guided missile is, or better yet, what it is not. A guided missile is not an aircraft and it is not dependent on aerodynamic surfaces to sustain itself in flight. Air, on which an aircraft is dependent for flight, is the greatest single enemy of a ballistic missile. A guided missile is a vehicle which travels through space at velocities up to several times the speed of sound. It may be guided to a designated target on the surface or in the air, either by a self-contained means of guidance or by some electronic means to exercise command control from the ground. Unlike an aircraft, there is no pilot on board to bring the missile back and report malfunctions.

Col. Patterson highlighted some important firsts accomplished by the Army team:

1953—First operational surface to air missile, NIKE-AJAX

May 1957—First successful flight of an IRBM-JUPITER

August 1957—First successfully recovered IRBM nose cone

January 31, 1958—Launching of the first U. S. satellite, Explorer I, which is traveling around the world at an average speed of 15,000 mph. at altitudes between 220-1600 miles above the earth. It is covering approximately 432,000 miles per day and will continue to do so for several years. Explorers III and IV were subsequently launched successfully and have provided much valuable information.

May 18, 1958—First recovered full-scale maximum range IRBM nose cone.

Col. Patterson outlined what the Army is doing to prepare itself for future warfare. The Army's progressive, forward looking missile development program is directed toward providing the mobility, flexibility, and destructive power which will be needed if we must fight another war. A movie on army missiles was then shown.

The Secretary of the Army directed the organization of the Army Ordnance Missile Command on Mar. 31, 1958, and appointed Major General J. B. Medaris as Commander. Assigned to this Command are the Army Ballistic Missile Agency, responsible for the development of the large ballistic missiles, the Army Rocket and Guided Missile Agency, responsible for the development of other Army missiles, and the White Sands Missile Range, where all missiles except the long-range missiles are tested.

Dr. von Braun, who was the chief scientist in the development of the V-2 rocket, is now the chief of the Development Operations Division at the Army Ballistic Missile Agency at Redstone. He and some 120 former German rocket and missile experts form the nucleus of the Army's ballistic missile development team.

Using a duplicate of the push button used to launch our missiles, Col. Patterson illustrated the importance of having and retaining in the Armed Forces personnel who not only have the capability of knowing how, but more importantly, knowing why.

In closing, Col. Patterson emphasized the need for educating the American public and the succeeding generations so we will be able to meet all challenges in the conquest of outer space.—**Reported by D. W. Gunther for Pittsburgh Chapter.**

Cites Effects of Nuclear Radiation

D. S. Billington, Director, Solid State Division, Oak Ridge National Laboratory, Spoke on "Effect of Nuclear Reactor Radiation on Metals and Alloys" at a Meeting in Milwaukee. He is shown, center, with R. G. Matters, left, technical chairman, and E. M. Taussig, program committee chairman

Speaker: D. S. Billington

Oak Ridge National Laboratory

D. S. Billington, director of the Solid State Division, Oak Ridge National Laboratory, spoke at a meeting of the **Milwaukee Chapter** on "The Effect of Nuclear Reactor Radiation on Metals and Alloys".

The effect of nuclear radiation on metals presents a serious problem to the designers of structures such as reactors and pressure vessels which will be subjected to such radiation. However, it is a potentially useful technique for the treatment of metals to obtain specific properties for research purposes. In radiation with high energy neutrons causes removal of many atoms from their lattice positions. The resulting structure contains many lattice vacancies and atoms in interstitial positions.

The most striking effects of nuclear radiation are on the ultimate, yield and impact strengths. The highly distorted structure causes large increases in yield and ultimate strength, with the yield to ultimate ratio sometimes approaching one. This suggests radiation as a potential technique to supplement alloying, cold working and heat treating for specific properties. The impact strength, however, is markedly reduced, accompanied by a rise in transition temperature. These effects are more pronounced at low temperature of radiation, since a higher temperature promotes annealing out of the lattice defects by a diffusion mechanism.

Dr. Billington also discussed the effects of radiation on the electrical properties of metals, and on the structure sensitive properties such as Young's Modulus and internal friction in extremely high-purity copper.

An interesting sidelight of the study of the behavior of metals subjected to nuclear radiation is the development of tools for metallurgical examination. The behavior of dislocations in the metallic lattice is easily studied when they are pinned down by displaced atoms. In addition, neutron diffraction patterns are a valuable supplement to X-Ray, since the scattering of neutrons is due to the structure of the nucleus, rather than to the electron configuration. Also, activation analysis permits the detection of minute quantities of impurities, while radioactive tracers permit the study of many solid state reactions.—**Reported by J. W. Quick for Milwaukee.**

MAKE A DATE FOR DALLAS

Second Southwestern Metal Exposition and Congress Will be Held in Dallas . . . May 9-13, 1960

Milwaukee Course Draws Record Attendance

One-Hundred Percent Attendance Certificates Were Presented to the 240 Persons Who Completed the Educational Course on "Heat Treat Processes and Techniques" Recently Completed by the Milwaukee Chapter

The 26th annual educational lecture series, entitled "Heat Treat Processes and Techniques", was concluded recently by the **Milwaukee Chapter.** This course was a sequel to the 1957 lecture series on "Heat Treatment of Steels". Last year emphasis was placed on metallurgical changes which occurred within steel during various types of heat treatments, this year the lectures covered methods of heat treatment, techniques used and choice of best methods for particular applications.

The lectures covered: "Preliminary Types of Heat Treatment", by I. R. Wood, metallurgical engineer, LaSalle Steel Co., "Straight Hardening, Drawing and Tempering", by W. J. Jabsen, metallurgical engineer, Kalamazoo Steel Process Co., Inc., "Induction Hardening", by H. B. Osborn, Jr., district manager, Ohio Crankshaft Co., and "Carburizing, Carbo-Nitriding and Nitriding", by C. A. Mueller, chief engineer, Gas Process Division, Lindberg Engineering Co.

Average attendance for each of the four lectures was 358 persons; 100% attendance certificates were presented to 240.—**Reported by David D. Legg, Sr., for Milwaukee.**

Role of Metallurgy in Production of Nuclear Power Topic at Ottawa

Speaker: E. C. W. Perryman

Atomic Energy of Canada Ltd.

E. C. W. Perryman, head, Research Metallurgy Branch, Atomic Energy of Canada Ltd., spoke on the "Role That Metallurgy Plays in Nuclear Power Production" at a meeting of **Ottawa Valley Chapter.**

Mr. Perryman first presented an interesting film, "Atomic Energy in Canada", which showed the production of uranium metal at Eldorado and the fabrication of natural uranium into fuel elements. The theory of the nuclear fusion chain reaction was explained and the structure and operation of various reactors were described.

Mr. Perryman discussed the Canadian program which is designed to produce economical nuclear electrical power and the metallurgical problems associated with the reactors. Having no U_{235} production, Canada's program is based on the use of natural uranium fuel and heavy water cooling and heavy water moderator.

Two nuclear power stations are being planned for Canada in the near future. The first N.P.D.-2 (Nuclear Power Demonstration) with a 20 megawatt output will be completed by 1961. It will use heavy water as the moderator and coolant and natural uranium oxide as the fuel. A second larger nuclear power station, CANDU (Canadian Deterium Uranium), of the same type as N.P.D., with 200 megawatt output, is now being designed. Other reactor types moderated with heavy water and using organic and steam coolants are being considered for future designs. The main problems facing the metallurgist are those connected with the fuel, sheathing material and pressure tube material.

Two main requirements for a fuel in a water-cooled reactor are adequate corrosion resistance and dimensional stability. Uranium metal has very poor corrosion resistance at the operating temperatures of a power reactor and, furthermore, is dimensional stability. Uranium metal has excellent corrosion resistance to water and is dimensionally stable.

As a sheathing material for the UO_2 fuel element, Zircaloy-2 has proved to be the best material available for resistance to corrosion, strength and low-neutron capture cross section. There is, however, a need for a zirconium-base alloy with similar corrosion resistance but better high-temperature mechanical properties than Zircaloy-2.

For pressure tube material, Zircaloy-2 is again the most attractive. The only other materials which could be considered from a reactivity standpoint are beryllium or some magnesium alloy. The former cannot be considered at the present time because beryllium technology is not sufficiently advanced. To use a magnesium alloy would necessitate the introduction of internal insulation such that the pressure tube could operate at a low temperature; this introduces serious engineering problems such as end fittings and safety aspects.

In the development of alloys and testing of materials for nuclear reactors, the only way to obtain answers on their performance under irradiation is by actual test in the reactor. —**Reported by R. D. McDonald for Ottawa Valley.**

Talks on Space Materials Testing

In a Happy Frame of Mind Are Principals at a Meeting of Chicago-Western Chapter During Which D. W. Gates, Materials Research, Army Ballistic Missile Agency, Spoke on "Material Testing for Space Applications". Shown are, from left: Paul K. Zimmerman, vice-chairman; Mr. Gates; Dick W. Hanzel, chairman; and E. D. Lynch, technical chairman

Speaker: D. W. Gates

Army Ballistic Missile Agency

D. W. Gates, Materials Research, Army Ballistic Missile Agency, Huntsville, Ala., lectured on "Material Testing for Space Applications" at a recent meeting of the **Chicago-Western Chapter.**

The talk was preceded by a movie illustrating the facilities at Redstone Arsenal and actual testing of the Redstone and Jupiter missiles.

The concepts of environmental testing of space materials are somewhat different than the ones we are adjusted to. Thus, conventional data describing high-temperature performance of metallic and ceramic materials refer to relatively long times and steady state conditions, whereas the heating periods encountered in missiles are in terms of seconds and minutes.

On the other hand, satellites are concerned with extremely long times, moderate heating rates and exposure to vacuums of the order of 10^{-13} and 10^{-15} mm. of Hg. Coupled with high vacua are meteorite impingement and radiation levels—in some cases unknown as to type and quantity.

Mr. Gates described various tests designed to weed out potential materials for space applications. Exposure of test pieces to rocket engine blasts, cyanogen burners, jet plasmas, etc., have been used; however, there still exists a need for exact environmental duplication. Presently we must be satisfied with reproducible tests which can be to some extent correlated with actual re-entry results. The two important factors in re-entry problems are heat flux rates and surface temperature. At very high rates a certain portion of the heat has to be absorbed by the material itself in order to reduce wall temperature to a level which supporting members can sustain. The short times at high temperature involved permit the use of the material itself for heat absorption. This may be accomplished by "ablation" which may be of three types: (1) liquid, in which the material itself absorbs thermal energy by heating and eventually melting away; (2) semigaseous, in which the materials melt and subsequently are vaporized; and (3) gaseous, in which the materials sublime. In general the structures, such as nose cones, which rest on the above principles for re-entry survival, consist of multicomponent systems. One example might be a porous ceramic body with an interdispersed metallic phase which upon melting or subliming dissipates the thermal energy.

In conclusion, Mr. Gates stated that it is of prime importance in any test program to be able to evaluate the factor in question without any extraneous parameters, but often we must be satisfied with a test procedure which is reproducible and supplying data correlatable with end results.—**Reported by D. J. Garibotti for Chicago-Western.**

Presents Toolsteel Talk in Boston

S. G. Fletcher, Latrobe Steel Co., Presented a Talk on "Dimensional Changes in Toolsteel as Affected by Structure" at a Meeting in Boston. Shown are, from left: W. H. McCarty, technical chairman of the meeting; Dr. Fletcher; and R. A. Pomfret, chairman. (Photo by H. L. Phillips)

Speaker: S. G. Fletcher

Latrobe Steel Co.

Stewart G. Fletcher, vice-president, metallurgy, Latrobe Steel Co., spoke at a meeting of the **Boston Chapter** on "Dimensional Changes in Toolsteel as Affected by Structure".

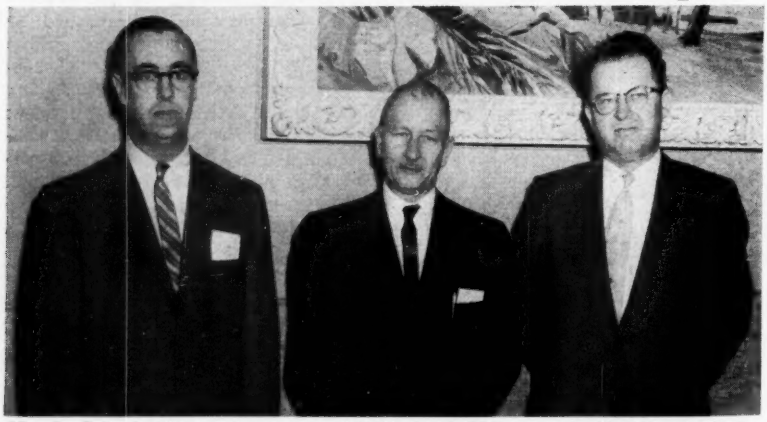
Dr. Fletcher opened his talk by stating that there are two areas of interest: (1) stability in heat treatment and (2) time stability (aging). The different types of changes are size or volume change due to structural changes and shape changes due to residual stresses.

He used slides to illustrate size and shape changes due to heat treatment. The shape changes are hard to predict because they are affected by internal stresses. Residual stresses that are either mechanical or thermal cause shape changes only. Sources of internal stresses are plastic deformation, machining, grinding, uneven heating or quenching.

Size changes and shape changes can be controlled by controlling the structure and internal stresses.

Dr. Fletcher concluded his talk by commenting on freak dimensional occurrences due to structure variations, nonuniformity of steel and lack of reproducibility.—**Reported by Stephen G. Demirjian for Boston.**

Talks on Flash-Welded Gas Line Pipe



M. A. Scheil, National Trustee A.S.M., and Director of Metallurgical Research, A. O. Smith Corp., Spoke on the "Manufacture, Metallurgy and Testing of Flash Welded Gas Line Pipe" at a Meeting in Calumet. Shown are, from left: M. W. Maxon, technical chairman; Mr. Scheil, and E. K. Phares, chairman. Mr. Scheil also described A.S.M. national activities

Speaker: M. A. Scheil

A. O. Smith Corp.

National Officer's Night at **Calumet** was high-lighted by the appearance of M. A. Scheil, director of metallurgical research, A. O. Smith Corp., and National Trustee A.S.M. Mr. Scheil first described the A.S.M. of the future and showed slides of the new headquarters building in Cleveland.

Mr. Scheil's technical talk was on the "Manufacture, Metallurgy and Low-Temperature Testing of Flash-Welded Gas Line Pipe". Equipment and methods used in the manufacture of pipe at A. O. Smith Corp. were described in detail and illustrated with slides. Simply stated, semi-killed 0.20-0.30 carbon medium manganese skelp is pickled, cupped, flash welded with a 6000 kva. welder and trimmed both inside and out. Weld testing, increased yield strength and dimensional uniformity of the pipe are assured by the next processing step, internal expanding. Hydrostatic testing, hammer testing and visual inspection are the final steps following the facing of the pipe ends. Clean, sound, homogeneous welds were cited as the cause of the good mechanical strength of pipe produced by this process.

Since a gas transmission pipeline is nothing more or less than a long-distance pressure vessel subject to extremes of climate and high stress, the problem of brittle fracture has become increasingly significant as pipelines have been expanded northward on the North American Continent. Mr. Scheil discused the factors involved in brittle failure of ferritic steels. He described a test program wherein burst tests of X52 line pipe were conducted at various temperatures to determine the performance of pipe in service, the effect of aging in service and the influence of various other variables in manufacture and service. The results of these tests showed that there was no tendency for the various grades of pipe to shatter when failure occurs and that the most practical assurance of good service life could be obtained by maintaining good supervision and inspection of field fabricating and laying operations. Steels with especially good low-temperature properties were recommended for regions subject to extreme cold.

New Films

What's In a Name?

Gardner-Denver Co. has produced a 17-min. sound and color film describing the development of the company since its founding. How the firm's products serve the construction, petroleum, mining and general industries is the theme of the film.

This film, "What's in a Name?", can be obtained by writing to: Film Library, Gardner-Denver Co., Quincy, Ill.

Film Catalog

Allegheny Ludlum film library has compiled a booklet listing more than 20 sound and color films which cover interesting aspects of production, fabrication and end-uses of stainless, tool and electrical steels and Carmet cemented carbides.

This booklet may be obtained by writing to the Film Library, Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.

Steel Shot Manufacture

The manufacture of Wheelabrator steel shot, from scrap selection to packaging methods, is depicted in a 25-min. 16-mm. sound and color film. Requests should be addressed to: Wheelabrator Corp., Abrasives Div., 1151 S. Byrkit St., Mishawaka, Ind.

Worcester Panel on Die Design

Leaders at a Joint Meeting of the Worcester Chapters A.S.M. and A.S.T.E. Included, Standing, From Left: E. L. Dolliff, B. Jahn Manufacturing Co.; E. E. Hall, Universal-Cyclops Steel Corp.; and Chester Hamilton, B. Jahn Manufacturing Co. Seated, from left, are: L. L. Krasnow, A.S.M. chairman; R. S. Morrow, A.S.T.E. technical chairman and moderator; and Daniel W. Hoyt, A.S.T.E. chairman, who presided. The program was a panel-type discussion on "Die Design, Steel Selection and Heat Treatment"

Metallurgical News and Developments

A Department of *Metals Review*, published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Devoted to News in the Metals Field of Special Interest to Students and Others

Test Sites Needed—The High Alloys Committee of the Welding Research Council is conducting an extensive study of the intergranular corrosion of austenitic stainless steels. Suitable industrial exposure sites are urgently needed. Specifically, media which have produced intergranular failure of stainless steel components are most desirable. Those interested are invited to submit a description of the exposure site to: R. M. Fuller, International Nickel Co. Inc., 67 Wall St., New York 5.

New Process—Johnston & Funk Metallurgical Corp. announces a significant development in titanium ingot melting techniques, which will have important ramifications in vacuum melting techniques, titanium scrap recovery and titanium welding. The process removes major contaminants of oxygen and nitrogen in vacuum melted titanium ingots below 1/10 of 1%, or well below the level at which embrittlement can take place.

International Congress—The International Council for Building Research Studies and Documentation . . . Congress, 1959, will be held in Rotterdam, Netherlands, from Sept. 21-25. The principal object of the Congress will be to widen the horizon of experts by presenting to them important building research and building documentation problems and results.

AIME Conference—The Mechanical Working Committee, Iron and Steel Div., The Metallurgical Society, A.I.M.E., will hold a Conference on "Flat Rolled Products" at the Del Prado Hotel, Chicago, Jan. 20, 1960.

Coating Process — Modification and improvement of a vapor phase process for deposition of chromium, molybdenum and tungsten to produce adherent coatings of the metals on various substrate materials has been announced by the Alloyd Research Corp., Watertown, Mass.

Pipe Welding—An automatic pipe welding machine which is capable of producing sound welds with full penetration without the use of backup rings has been developed by Aluminum Co. of America, Pittsburgh 19. The unit completes a pass on 4 in. pipe in 11 sec.

AEC Grants—The Atomic Energy Commission has approved grants totaling $251,704 to 12 American colleges and universities to encourage radioisotope technology training. Information can be obtained from the Director, Office of Isotopes Development, U. S. Atomic Energy Commission, Washington 25, D. C.

Develop New Alloy—A zirconium-copper alloy, Amzirc, consisting of high-conductivity, oxygen-free copper and carefully controlled concentrations of high-purity zirconium, has been developed by American Metal Climax, Inc., 61 Broadway, New York.

Summer Courses—A catalog of engineering short courses and conferences to be held by the New York University is available through the Office of Special Services to Business and Industry, 6 Washington Square North, New York 3.

Changes Name — The Hamilton Foundry & Machine Co. has changed its name to Hamilton Foundry Inc. to reflect more accurately the nature of the business and services rendered to iron castings users.

Aluminum Alloy—American Smelting and Refining Co., 120 Broadway, New York 5, has announced the development of an aluminum alloy, Adaptaloy, with unique mechanical characteristics, including exceptionally high elongation and impact strength and ability to sustain bending and deformation.

Grants Canadian License—The Armalite Co., Ltd., Toronto, has been licensed by Northwest Chemical Co., Detroit, to manufacture and sell its metal finishing products in Canada.

Meeting in Spain—The 26th International Congress of Founding will be held in Madrid, Spain, from Oct. 4 to 10, 1959. The Instituto del Hierro y del Acero (Institute of Iron and Steel) will hold its fourth General Assembly at the same time, and issues an invitation to interested American metallurgists to join in the activities of the Congress. Information from: Instituto del Hierro y del Acero, Villanueva, 13, Madrid.

Symposium Scheduled—An International Symposium on High-Temperature Technology, arranged by Stanford Research Institute, will be held Oct. 6 to Oct. 9, 1959, at Asilomar Conference Grounds, Calif. (Monterey Peninsula, 120 miles south of San Francisco). Schedule of program and other information is available from Box 734, Stanford Research Institute, Menlo Park, Calif.

Metal Plating Process—A metal plating process performed by heat treating has been announced by Metallurgical Consultants, Inc., 4935 E. Slauson Ave., Maywood, Calif. The process, Pyro-Plate, reduces plating operations to bare essentials but is so effective that it transforms a thin layer of plating substance into an integrated part of the base metal.

High-Temperature Alloys—A series of columbium-base alloys, characterized by high-temperature strength, has been announced by Fansteel Metallurgical Corp., North Chicago, Ill. These alloys, Fansteel 80 and Fansteel 82, are expected to find substantial uses in missiles, rockets, space craft and fields where high temperatures are encountered.

Metal Processing, Cutting—A University Extension Course on Metal Processing—Cutting, is being offered by the University of California, Los Angeles 24, Calif., from July 20 through July 31. The course will cover the estimation and analysis of cutting forces and the use of cutting dynamometers.

Offers New Course—Effective next Fall the Pennsylvania State University will offer a curriculum in engineering mechanics which will lead to a B.S. degree.

Proceedings Available — Proceedings of the Seventh Annual Conference on Industrial Applications of X-Ray Analysis, held in August 1958, are now available from the Denver Research Institute, University of Denver, Denver 10, Colo. The price is $7.50.

Presents Discussion on Patents

F. E. Robbins, Patent Attorney, Spoke on "Chemical and Metallurgical Patents" at a Meeting of Eastern New York Chapter. Shown are, from left: J. H. Keeler, General Electric Co. Research Laboratory; J. H. Westbrook, chairman; Mr. Robbins; and E. R. Stover, the technical chairman

Speaker: F. E. Robbins

Patent Attorney

Frank E. Robbins, patent attorney, Rochester, N. Y., spoke before the **Eastern New York Chapter** on "Chemical and Metallurgical Patents".

He first gave a brief history of the origin of patents and described the close correlation between the growth of the iron industry in England and the growth of the patent system.

Our modern patent system evolved from that part of the U. S. Constitution which provides that Congress shall have the power to promote the progress of science and the useful arts by securing for authors and inventors, for a limited time, the exclusive right to their writings and discoveries.

A contrast was drawn between our system and the Russian system. In the U. S., title to a patent belongs to the inventor and can be assigned or licensed by him. In Russia, all patents become the property of the state and any rewards for the inventor are fixed by the state. Under our system, individual initiative is rewarded through the patent system.

Under our law, new chemical compositions, such as alloys, can be protected by patents if the proportions of the components are new and unexpected results or properties are obtained. The process of making an alloy, which may consist simply of mixing the proper proportions of the components often may be unpatentable. This was contrasted with German practice, where protection for an alloy as a product may be very difficult to obtain, although the process of making the alloy, if the alloy is new, is patentable, and under German patent law, the process patent is considered to cover the product. The difficulties that arise from the differences in German and U. S. practice were illustrated by a description of an instance in the U. S. Patent Office between two U. S. applications, one of German origin, which contained only process claims, and a U. S. application, containing only product claims. As an additional complicating factor, the only common ground between the two applications was the percentage figure which was the upper limit of one component in the German process and the lower limit of the same component in the U. S. product.

The characteristics of successful inventors are perseverance, originality and analytical ability. In recognition of the fact that most new ideas look unusual, even crazy, when introduced, persistence is required to secure the adoption of a new idea. Several large U. S. industrial corporations have special awards systems for rewarding inventors who are successful in having beneficial new ideas adopted over management opposition.—**Reported by Louis Ianniello for Eastern New York.**

Mahoning Members Tour Copperweld Steel Plant

Members of the **Mahoning Valley Chapter** toured the Aristoloy Steel Division, Copperweld Steel Co., Warren, Ohio, recently. This division supplies carbon and alloy blooms, billets and bars to Copperweld divisions as well as to other customers.

Following dinner in the plant cafeteria, the tour commenced in the melt shop and followed the flow of steel through the rolling, conditioning and inspection stages.

The melting facilities consist of eight electric-arc furnaces ranging in capacity from 40 to 75 tons per heat. These furnaces are top charged with steelmaking scrap and are powered by transformers pulling up to 20,000 kilovolt amperes. On the average, four hours are required to produce a heat of steel to specifications. Each furnace is carefully supervised by three furnace helpers and a melter. When the alloy and carbon specifications are met, the heat is poured into a ladle and teemed into molds.

Heated ingots from the soaking pits are rolled on a two-high 35 in. blooming mill from ingot size as low as 7 x 7 in. After leaving the blooming mill, the blooms pass under an automatic hot scarfing machine and then to the 29 or 24 in. mills where they can be further reduced from 7 to 4½ in. If a smaller size is required, they pass through the 21 in. mill or the 20 in. continuous mill. To facilitate handling, the original ingot, now quite sizeable in length, is sawed into pieces.

Steels rolled on the 35, 29, 24, 21 and 20 in. mills are inspected and defects are removed by hand scarfing and machine chipping.

Billets from the 35 in. mill are reheated and rolled on the 18 and 12 in. mills, emerging in size as low as 9/16 in. rounds. From the hot beds the steel can be sheared, bundled, weighed and tagged ready for shipment.

Annealing operations are performed in the finishing department. After annealing, stock can be oil or water quenched, straightened or turned.

In the manufacture of concrete reinforcement bars, in the Webrib department, after rolling on the 18 and 12 in. mill, Webrib, high-strength steel, is cold twisted in such a manner that a far greater yield and bond is realized.

In the cold draw department bars are pickled in sulphuric acid to remove scale, washed in water and then dipped in a hot lime solution, which tends to neutralize any acid that might remain, prevents rusting and serves as a lubricant in the drawing operation.

The last rolling mill on the tour was the 21 in. mill where blooms up to 10 in. in size are rolled down to sizes as low as 1½ in. rounds. This mill is one of the most productive commercial mills, of comparable size, in the country.—**Reported by E. J. Fromm for Mahoning Valley.**

Named President of French Metals Society

Paul Bastien has assumed the presidency of the French Society of Metallurgy (Societe Francaise de Metallugie, 25, rue de Clichy, Paris 9e, France) for the year 1959, replacing the departing president, Pierre Epron. M. de Leiris has been appointed vice-president, and Max Dupont has been named secretary-general of the Society, to replace Eugene Dupuy who is retiring.

Hot and Cold Working of Metals Is Pittsburgh Educational Subject

The **Pittsburgh Chapter** has completed its fourth annual educational lecture series. The subject for 1959 was "Hot and Cold Working of Metals".

Duplicate meetings were held on four successive Wednesdays, Mar. 18 through Apr. 8, for the Pittsburgh group, and on Mondays, Mar. 16 through Apr. 6, for the Beaver Valley Activities Committee, which is sponsored by the Pittsburgh Chapter.

Total registration was 350, with 233 registrants in the Pittsburgh and 117 in the Beaver Valley course. This was the largest registration on record for a Pittsburgh Chapter educational activity.

G. T. Horne of Carnegie Institute of Technology spoke on "Fundamentals of Hot and Cold Working", H. Freeman, Universal Cyclops Steel Corp., covered "Hot Working of Alloy Ingots", D. A. Edgecombe and C. P. Church of Babcock and Wilcox Co., presented talks on "Hot Extrusion of Metals", and J. F. Griffin of U. S. Steel Corp., covered "Modern Methods of Producing Flat-Rolled Products".

For reference purposes the U. S. Steel Corp. publication "Making, Shaping, and Treating of Steel" was made available to registrants who participated in the course.

Interesting question and answer periods were held after each of the lectures.

Dayton Completes Educational Series

The Dayton Chapter Has Just Concluded a Very Successful Educational Series on the "Microstructure and Mechanical Properties of Steel". Shown at one of the four meetings are, from left: Robert Fossi and W. D. Walther, educational committee; Robert Boni, Armco Steel Corp., the speaker; and Robert Sutton and David Heckard, educational committee

Speaker: R. Boni

Armco Steel Corp.

Robert Boni, Research Laboratories, Armco Steel Corp., presented the annual educational program of the **Dayton Chapter.** The program was given in four lectures, as follows:

"Phase Transformation Studies", "Effect of Transformation Products on Fatigue, Impact and Ductility", "Influence of Nonmetallic Inclusions and Hydrogen on Mechanical Properties" and "Optimum Properties by Process Control".

The lecture series was illustrated with over 50 slides of microstructures and mechanical property data. A movie from the Unitron Co. showed the austenite to bainite and austenite to martensite transformations at temperature. Over 150 government, university and industrial technical reports from the past five years were drawn upon as source material for the course.

After a brief review of the Fe-Fe_3C, isothermal and continuous T-T-T diagrams, current theories and characteristics of pearlite, ferrite, bainite and martensite formation were discussed. Detailed information and data were presented which related the percentage of each transformation product present to mechanical properties. such as fatigue strength and impact strength. In the third lecture the influence of inclusion content and type on longitudinal and transverse properties was discussed. Hydrogen embrittlement theories were reviewed and its characteristics, such as ductility loss and delayed fracture phenomena, described. The final lecture was devoted to procedures which reduce or eliminate hydrogen embrittlement in high-strength parts. Also, results of recent studies aimed at producing 400,000 psi. tensile steels were reviewed.

While the course was aimed at the operating metallurgist, approximately 40 technicians and other engineers participated in the program. In addition approximately 55 A.S.M.'ers attended the lectures. — **Reported by William D. Walther for Dayton.**

Dr. Aborn Visits Kansas City

A.S.M. National Treasurer Robert H. Aborn, Director of the E. C. Bain Fundamental Research Laboratories, U. S. Steel Corp., Presented a Talk on "Metallurgical Phenomena Associated With Ferrous Welding" at a Meeting of Kansas City Chapter. He discussed the effect of alloy content on weld structures, effect of cooling on weld structures, and gave a survey of what might be expected in the future as to welding procedures and techniques. Shown are, from left: C. K. Kenyon, chairman; Gerald Hummon, secretary; Dr. Aborn; and Bill Deterding, vice-chairman

A.S.M. has created the Metals Engineering Institute, the home study school of the metals industry.

On Geometry of Sintering

F. N. Rhines (left), University of Florida, Who Gave a Talk on the "Geometry of Sintering" at an Oak Ridge Chapter Meeting, Is Shown With L. K. Jetter

Speaker: F. N. Rhines
University of Florida

Members of the **Oak Ridge Chapter** heard F. N. Rhines, University of Florida, discuss "The Geometry of Sintering" at a recent meeting.

Dr. Rhines pointed out that sintering is a geometric process and that most experimentalists have studied only limited aspects of the process. Particles to be sintered are usually treated as spherical, whereas in reality such spherical particles do not exist. Even if one assumes spherical particles initially, once sintering starts this shape no longer remains.

Since sintering is concerned with irregular shapes, topology, or the study of closed surfaces, was applied by Dr. Rhines. Topology allows the experimentalist to ignore direction and dimensions and to treat the particles as elastic surfaces.

Starting with a mass of powder, the surface area and volumes can be obtained and the topological "genus" of the surfaces can be determined. The "genus" was defined as the number of cuts or separations which would be required to reduce the shape to zero genus, the equivalent of a sphere.

A formula was presented for calculating "genus", $G = C + P - 1$, where G is the genus, C is the number of particle contacts and P is the number of particles.

With the aid of slides, the speaker demonstrated that the initial rate of densification in sintering is proportional to the number of interparticle contacts. The slides revealed a simple relationship between the internal surface area of the sintered body and its density which was confirmed experimentally.

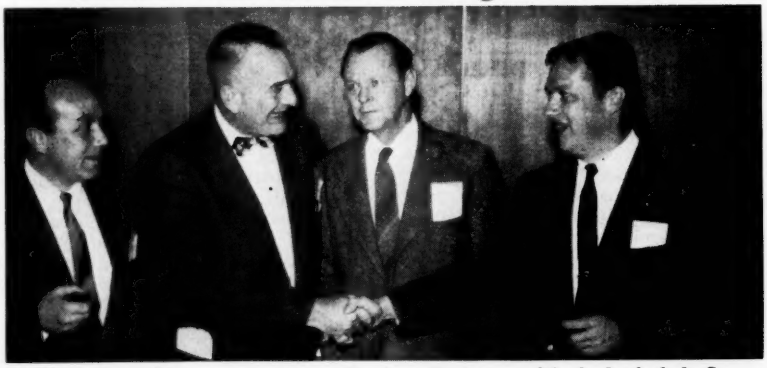
A question and answer period followed the formal presentation.—**Reported by A. Goldman for Oak Ridge.**

A.S.M. is the largest publisher of books for the metals industry in the world.

Receives Chairmen's Certificate

Lester C. Hill (Right) Is Shown as He Received His Past Chairman's Certificate From S. G. Fletcher, Present Chairman, at a Meeting of the Pittsburgh Chapter

Golden Gate Joins in Engineers Week



Golden Gate Chapter Activities During Engineers Week Included Career Counseling at the High-School Level, Talks Before Various Societies and Civic Groups to Focus Attention on the Aims of the Engineering Professions and Scholarship Awards to Three Outstanding Students. Shown at a recent meeting of the Chapter are, from left: Bob Bertossa, public relations vice-chairman; Harvey Davis, Engineers Week chairman; Sonny Hutton, Thos. Hutton and Son, and Bobby Ray, Golden Gate chairman

Discusses Brittle Behavior of Metals

"Brittle Behavior of Metals" Was the Topic of Discussion at the National Officers Night Meeting Held by the San Fernando Valley Chapter. Shown are, from left: D. E. Roda, past chairman; C. H. Lorig, national president A.S.M.; R. P. Frohmberg, chairman; C. C. Woolsey, executive committee member; and D. S. Clark, past national president A.S.M.

Meet Your Chapter Chairman

LOUISVILLE

H. F. KELLER, Jr., of New Albany, Ind., graduated from Purdue University in 1950 with the degree of B.S. in metallurgical engineering. His first job was with Caterpillar Tractor Co., for about a year, then he joined American Standard Plumbing & Heating Division. He is now a metallurgical engineer in the research department. "Hank" is a really active member, having been chairman of the membership and yearbook committees, secretary and treasurer for several years and vice-chairman. He belongs to the American Foundrymen's Society and is an officer in the men's club of his church.

During World War II he was with the army in the European theater as staff sergeant in the field artillery. He has four children and makes a hobby of photography and woodworking.

SOUTHERN TIER

PETER V. SCHNEIDER is a graduate of Illinois College, Jacksonville, with an A.B. degree in chemistry. He took additional courses in metallurgy at Indiana and Purdue Universities and Armour Tech., and has made a career of powder metallurgy, beginning at Glidden Co., Hammond, Ind., as superintendent of the Iron Powder Division. He was later associated with P. R. Mallory & Co., as senior metallurgist, Powdered Metal Products Corp., Franklin Park, Ill., as chief metallurgist and technical advisor of powdered metal with Ford Motor Co., Dearborn, before accepting his present position as project metallurgist with International Business Machines Corp., Endicott, N. Y.

At a joint meeting of the A.S.M. and Metal Powder Industries Federation in the past National Metal Congress he served as panelist on a powder metal panel discussion. A member of several other technical societies, he is past chairman of the Detroit Powdered Metal Society. He follows all sports with interest and enjoys golf.

HARTFORD

WILLIAM R. EDGERTON is a 25-year member A.S.M. and has been treasurer and vice-chairman of his chapter. He studied metallurgical engineering at Rensselaer Polytechnic Institute and was with the Pennfield Saw Works before taking his present position as director of research, Whitney Chain Co., Hartford.

Mr. Edgerton served in the army during the war. He is a member of the U. S. Power Squadron as well as the American Petroleum Institute and American Society of Agricultural Engineering. He attends the First Church Christ Congregational and enjoys boating as a hobby.

ONTARIO

J. HOWARD POPE, regional manager of Liquid Carbonic Canadian Corp., and Imperial Oxygen, Ltd., was born in Stanstead, Quebec. After graduating from McGill University he went to Dominion Rubber Co. as industrial engineer, then was manager of Wall Chemicals Canadian Corp. for several years before taking his present position.

Mr. Pope is a member of the chapter council and has been treasurer and vice-chairman. He is active in other technical organizations and takes part in civic affairs. As fund chairman of the McGill Society of Toronto he received the Alma Mater Award for outstanding achievement in 1954. He is currently directing the 93rd Toronto Scout Group Committee. Military service was as a captain of the Royal Canadian Electrical Mechanical Engineers.

Son Bryer is 14, and daughters Virginia and Barbara are 13 and 10 years old. For recreation Mr. Pope enjoys curling.

YORK

EDWARD T. VITCHA was born in Cleveland, Ohio, and received his degree of B.S. in metallurgical engineering from Case Institute of Technology. He is now manager of the metallurgical and chemical department, Thompson-Ramo-Wooldridge Corp., Harrisburg, Pa., Works.

From 1941 to 1945 Mr. Vitcha was a captain in the U. S. Air Force, stationed in the Aleutian Islands. His wife is the former Elizabeth Cowan of Sault St. Marie, and they have one daughter, Nancy. He takes an active interest in civic improvements and makes a hobby of woodworking and horticulture.

DELAWARE VALLEY

J. BENEDICT KOPEC, metallurgical engineer, Openhearth and Hot Rolling Mills, John Roebling's Sons Corp., was born in Indiana. After obtaining his B.S. degree in metallurgical engineering at the University of Pittsburgh, he went to Jones & Laughlin's Wire Mill Laboratory as assistant tensile tester. About a year later he started his openhearth work at Carnegie Illinois Steel in Homestead and later joined the Acid Openhearth Research Assoc., Inc., of the University of Pittsburgh as research engineer. He is currently president of that organization.

Before becoming chairman Mr. Kopec served as vice-chairman of his chapter. He is also a member of the American Institute of Mining and Metallurgical Engineers. He has two children.

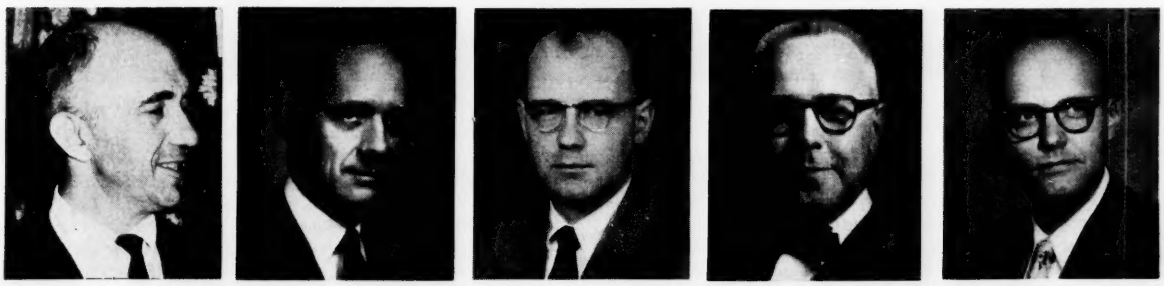
PUGET SOUND

JOHN W. (Jack) SWEET, born in Seattle, has been a member for 22 years. He has a B.S. degree in engineering and started with Boeing Airplane Co. in the engineering design group working on the B-17, then into testing and inspection and later joined the metallurgical unit during production of the B-29. He is now chief metallurgist of the Seattle Division.

Jack is on the executive board, was formerly vice-chairman and has served on the A.S.M. Metals Handbook committee on properties and applications of aluminum. A member of the Metal Progress Advisory Committee for reviewing the editors "Critical Points", he is also a panel member in other technical societies covering aviation, nondestructive testing and titanium research, as well as the National Advisory Committee for Aeronautics Subcommittee on Aircraft Structural Materials.

Daughter Elizabeth Ann is a student at the University of Washington and son John Robert attends Seattle Preparatory School. Other interests include teenage advisor, do-it-yourself projects, skiing for recreation, and a commission in the Naval Reserve.

E. T. Vitcha *J. H. Pope* *W. R. Edgerton* *P. V. Schneider* *H. F. Keller, Jr.*



METALS ENGINEERING INSTITUTE NEWS

Chapters Use M.E.I. Courses

During the current season, Metals Engineering Institute courses are being used as chapter-sponsored extension courses in five major cities: Los Angeles, San Francisco, Worcester, Mass., Rochester, N. Y. and Cleveland. The two California chapters are unusually active, offering two separate M.E.I. courses simultaneously.

In addition the Warren (Ohio) Chapter is in close contact with M.E.I. headquarters and expects to have a course in progress very soon.

A.S.M. officers and M.E.I. staff members have been in touch with numerous other chapters for the express purpose of arranging for presentation of the comprehensive courses next fall. Those actively seeking details at this time include New Jersey, Utah, Columbus, Calumet and Terre Haute Chapters, and it is quite likely that the five cities now offering the courses will continue the program next season.

New Courses Scheduled

Three authors of new M.E.I. courses are working at top speed to prepare three subjects for this fall. These are "Principles of Machining" by William Backer of the Norton Co., Worcester, Mass., "Testing and Inspection of Metals" by C. H. Philleo of the General Electric Co., Cincinnati, and "Corrosion" by M. G. Fontana, Ohio State University.

It is anticipated that these courses will be extremely popular. For information regarding release dates and other details, write to: Metals Engineering Institute, 7301 Euclid Ave., Cleveland 3, Ohio.

Woman Completes Course

Mrs. Lena E. Kennedy of the Oklahoma Steel Castings Co., Inc., has the distinction of being the first woman student to complete a metallurgical course by correspondence with the Metals Engineering Institute. Two women preceded her as M.E.I. graduates; however, they participated in chapter-sponsored extension courses in Los Angeles and Cleveland.

Mrs. Kennedy completed the course on "Stainless Steels" in slightly less than a year. She has been with the Oklahoma Steel Castings Co. for 14 years and is employed as an assistant welding supervisor. She is married and has two children and has found time to pursue a study program in her "spare" moments. "I am proud to have been a student in such a wonderful institute", Mrs. Kennedy reported. M.E.I. too, is proud of her achievement in home study. She received one of the highest grades ever given in this course.

Presentation of a plaque to Mrs. Kennedy was made at a regular meeting held by the Tulsa Chapter on Mar. 3. She has been a member of A.S.M. for 10 years.

METALS ENGINEERING INSTITUTE IS ON THE MOVE

(For additional information on M.E.I., see p. 34)

Twelve Men From M & C Nuclear, Inc., Attleboro, Mass., Received M.E.I. Certificates for Successful Completion of the Course "Elements of Metallurgy". Shown with the group are William Glenn, Jr., manager of research and development, and the three instructors, Messrs. Davis, Flanders and Lynch. Seated in the front row, from left, are: John White, Stanley Ryng, Gordon Davis, research associate, Martin Carr, Ronald Stark and Roger Sherman. Back row, from left, are: George Dulude, Robert Flanders, assistant chief materials development engineer, Fred Michelson, James Cadden, William Glenn, Jr., Norman Hindley, Joseph Gibola, Peter Lynch and Earl Payette. James Barker, who was not present when the picture was taken, also received a certificate at the special meeting held in the plant cafeteria above

The 14th METALLOGRAPHIC EXHIBIT

Chicago, November 1 to 6, 1959

All metallographers—
everywhere—
are cordially invited to
display their best work.

RULES FOR ENTRANTS

Exhibitors do not need to be members of the American Society for Metals.

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable.

Photographic prints should be mounted on stiff cardboard, extending no more than 3 in. beyond edge of print in any direction; maximum dimensions 14 by 18 in. (35 by 45 cm.). Heavy, solid frames are unacceptable.

Entries should carry a label on the *face of the mount* giving:

Classification of entry.

Material, etchant, magnification.

Any special information as desired.

The name, company affiliation and postal address of the exhibitor should be placed on the *back of the mount* together with a request for return of the exhibit if so desired.

Entrants living outside the United States should send their micros by first-class letter mail endorsed "Photo for Exhibition—May Be Opened for Customs Inspection".

Exhibits must be delivered before Oct. 15, 1959, either by prepaid express, registered parcel post or first-class letter mail, addressed:

Metallographic Exhibit
American Society for Metals
53 W. Jackson Blvd.
Chicago 4, Ill., U.S.A.

CLASSIFICATION OF MICROS

Class 1. Cast irons and steels
Class 2. Carbon and alloy steels (wrought).
Class 3. Stainless steels and heat resisting alloys.
Class 4. Aluminum, magnesium, beryllium, titanium and their alloys.
Class 5. Copper, nickel, zinc, lead and their alloys.
Class 6. Uranium, plutonium, thorium, zirconium and reactor fuel and control elements.
Class 7. Metals and alloys not otherwise classified.
Class 8. Series showing transitions or changes during processing.
Class 9. Welds and other joining methods.
Class 10. Surface coatings and surface phenomena.
Class 11. Slags, inclusions, refractories, cermets and aggregates.
Class 12. Electron micrographs.
Class 13. Results by unconventional techniques.
Class 14. Color prints in any of the above classes. (No transparencies accepted.)

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which in the opinion of the judges closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $500 from the Adolph I. Buehler Endowment will also be awarded the exhibitor whose work is judged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's national headquarters.

All prize-winning photographs will be retained by the Society for one year and placed in a traveling exhibit to the various Chapters.

41st NATIONAL METAL CONGRESS & EXPOSITION

INTERNATIONAL AUDITORIUM — — — CHICAGO — — — NOV. 1 to 6, 1959

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers: c/o A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

RESEARCH METALLURGIST: M.S. or Ph.D. Opportunity to do research and grow with young, dynamic organization. Investigations presently underway in fields of high-temperature metallurgy, electronic materials, ceramics, etc. Located 20 min. from New York City. Send resume to: Personnel Director, Materials Research Corp., 47 Buena Vista Ave., Yonkers, N. Y.

METALLURGICAL ENGINEER: Prominent manufacturer of mechanical power transmission equipment requires metallurgical engineer, with up to five years experience, for quality control and process development work. Good working knowledge of heat treating, physical testing and metallography required, plus some chemical analysis and electroplating. Challenging opportunity in university city located in vacation and cultural area. Box 6-5.

BRAZING ENGINEER: Age to 40. Experience in fabricating, sectional heat treating, production and shop management. Excellent opportunity for advancement. Send resume of experience, residence and telephone number. All replies confidential. Box 6-10.

TECHNICAL DIRECTOR: With metallurgical background, to plan and direct development and technical aspects of production of strip, wire and tubing for small but fast-growing specialty mill. Ferrous, nonferrous, refractory, precious and clad metals. Located in suburban New York City. Excellent opportunity for recognition and reward. Salary commensurate with ability and record of achievement. Box 6-15.

METALLURGIST: For research and development projects with wide variety of materials and alloys used in production of aircraft and railroad equipment. B.S. degree in metallurgy plus two to three years laboratory experience in metallurgical research, development and test activities required. Located in Watertown, N. Y. Salary from $6800 to $7800. Send resumes to: Ellis S. Boynton, New York Air Brake Co., 230 Park Ave., New York 17, N. Y.

METALLURGISTS: Naval Air Material Center engaged in extensive program of aeronautical research, development, experimentation and test operations for advancement of naval aviation needs metallurgists ($4490 to $9530 per year) for work on high-strength steels, precision castings, heat resistant alloys, oxidation resistant coating for molybdenum, inert and shielded metal arc and resistance welding. Positions include research, development and evaluation-type duties. Interested persons should file an Application for Federal Employment, Standard Form 57, with the Industrial Relations Dept., Naval Air Material Center, Naval Base, Philadelphia 12, Pa.

METALLURGIST: Administrative staff opening for college graduate with background as follows: metallurgist, preferably nonferrous, with experience. Responsibilities include organization of technical classes and supervision of metallurgical education program but does not include teaching. Some travel. Write: Mineral Industries Extension, 102 Mineral Sciences Bldg., Pennsylvania State University, University Park, Pa., giving educational and vocation background.

Midwest

METALLURGIST: With college background in metallurgy and practical experience in the field, to teach metallurgy, metallography, heat treatment and testing in two-year post high-school institute. Age to 45. Send resume of qualifications to: H. E. Barg, 1015 N. Sixth St., Milwaukee 3, Wis.

METALLURGIST: Degree or equivalent training. Age to 30. One to five years experience in steel mill, technical sales or ferrous heat treating and fabricating. Excellent opportunity for growth, advancement in areas of technical sales, sales, management or plant operations. Prominent specialty steel processor, multiple plants. Send resume, experience, residence and telephone. Box 6-20.

SENIOR PROJECT ENGINEER: For pure metals research. Extractive metallurgy and minerals beneficiation background desirable. Applicants must be qualified to plan, conduct and supervise research and development projects in modern laboratories. Ph.D. with at least five years experience preferred. Position offers attractive opportunities for advancement and increased responsibility. Confidential. Send complete resume and state salary anticipated to: H. W. Rathmann, Director of Process Research, Vanadium Corp. of America, Research Center, Cambridge, Ohio.

FERROUS PROCESS AND PHYSICAL METALLURGISTS: With one to five years experience in iron and steel industry, to work with expanding research and development organization in large and extremely diversified steel producing facility. Openings available for metallurgical engineers familiar with and having a working knowledge of blast furnace, sintering plant, various steel producing processes, rolling mills and product physical metallurgy. B.S. degree required. If you desire a challenging assignment with an opportunity for professional growth and advancement, send complete resume. Box 6-25.

WELDING DEVELOPMENT ENGINEER: To supervise welding development research projects, investigate fabrication welding problems and prepare research reports. Work will include welding of new alloys and studies of new welding processes for fabrication of nuclear power equipment and alloy pressure vessels. One to three years in welding development work or applied welding engineering with thorough knowledge of welding processes and techniques required. Experience in metallurgical testing of weldments, fabrication shop practices, welding codes and specifications desirable. B.S. degree. Send resume to: G. Y. Taylor, Administrative Services, Alco Products, Inc., Schenectady 5, N. Y.

METALLURGIST AND METALLURGICAL ENGINEER: With manufacturing and research background, to assist in setting up and supervising development programs and coordinating metallurgical and welding data. Three to five years experience. Degree required. Send resume to: G. Y. Taylor, Administrative Services, Alco Products, Inc., Schenectady 5, N. Y.

METALLURGIST - METALLOGRAPHER: Young man interested in metallurgical research to take charge of metallographic laboratory. Work will include both light and electron microscopy in many phases of metals research. B.S. degree and some experience required. Write: Technical Recruitment, Chrysler Engineering Division, P. O. Box 1118, Detroit 31.

HEAT TREAT SUPERINTENDENT: To assume full charge of production commercial plant. Wide metallurgical knowledge and sales experience necessary. Profit sharing. Send resume to: Metal Treating, 9825 Greeley, Detroit 11, Mich.

South

METALLURGIST: Opportunity for graduate engineer experienced in furnace operations and quality control of ferro-alloy production, especially chrome, silicon and manganese. Southern locations. Preferred age, in thirties. Salary open. All correspondence strictly confidential. Box 6-30.

METALLURGIST: B.S. in metallurgy or equivalent education, to work on interesting new problems in high-temperature gas corrosion and process metallurgy for nuclear reactor project. Nuclear experience valuable but not essential. Send resume to: L. C. Furney, Personnel Director, General Nuclear Engineering Corp., Dunedin, Fla.

PHYSICAL METALLURGIST: To teach physical metallurgy, metallography, nuclear metallurgy and solid state physics at a southern university. Candidate should have a Ph.D. degree and rank will depend upon teaching experience and industrial experience. Mail details of experience in application. Box 6-35.

West

PHYSICAL METALLURGIST: At large Navy research and development center in Southern California. Work consists of material evaluation, consulting on material selection and heat treatment and applied research. Minimum requirements are B.S. degree and 3½ to 4 years experience. Working, living conditions unusually good. Salary $8800. Box 6-40.

TEACHERS—TWO: For department of metallurgy. One, department head, Ph.D. preferred, physical or process metallurgy. Teaching and research. Rank and salary dependent on qualifications. Apply: President, Montana School of Mines, Butte, Mont.

PHYSICAL METALLURGIST: Development of aluminum alloys and fabricating practices. Pacific Northwest. Salary commensurate with education and experience. Box 6-135.

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Good used Stress Rupture Testing Equipment. Advise details to:

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Muskegon, Mich.
Att: R. J. Wilcox

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2—4 Yrs. Experience

Excellent opportunity in Development Section of Metallurgical Department for capable young metallurgist to grow professionally and to acquire experience in forging and the physical metallurgy of high-strength, heat resisting and refractory metals and alloys.

Candidate will assume responsibility of completing planned development projects under supervision of development metallurgist.

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The J&L Research Division wishes to add to its staff in 1959 several professional metallurgists, to broaden the scope of the Corporation's research programs in carbon and stainless steels.

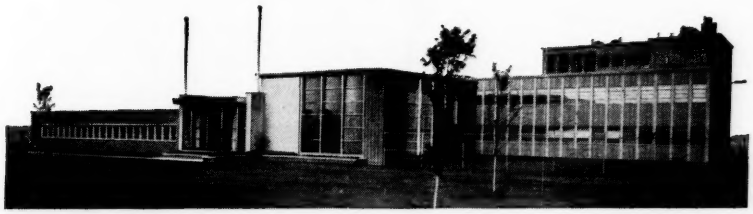
Of specific interest are physical metallurgists (Ph.D., or M.S. with related research experience) to conduct projects in high-temperature materials, alloy development, corrosion, general applied physical and mechanical metallurgy.

Several openings exist also for recent B.S. graduates, in the fields described above and in projects dealing with steelmaking process analysis and development. For the B.S. graduate interested in a permanent research career, Pittsburgh offers unmatched opportunity for continued education at the graduate level.

J&L is fourth-largest in the United States steel industry, making a wide variety of carbon and stainless steel products. The Research Division is located in modern facilities in suburban Pittsburgh.

J&L STEEL

Send resume, in confidence, to John A. Hill
Research and Development Department
Jones & Laughlin Steel Corporation
3 Gateway Center, Pittsburgh 30, Penna.



MATERIALS RESEARCH OPPORTUNITIES

Openings are available for men with various levels of experience, from recent graduates to eight years of experience and with B.S., M.S., and Ph.D. degrees to work on the following challenging high-temperature material problems at the CONNECTICUT AIRCRAFT NUCLEAR ENGINE LABORATORY (CANEL).

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. . . joining development
. . . alloy research and development
. . . manufacturing metallurgy
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CERAMICS

. . . high-temperature materials research and development

send resume including salary requirements to Mr. H. S. Wilson, Jr., Office 15

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Division of United Aircraft Corporation

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The Knolls Atomic Power Laboratory invites inquiries for current openings on a number of advanced nuclear programs. Interested candidates will find these positions offer excellent opportunities to contribute creatively toward the solution of challenging problems arising in the design of nuclear reactors and powerplants.

If you have an appropriate degree and significant related experience, the Laboratory can offer immediate placement in these fields:

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- ☐ **Materials irradiations experiments**
- ☐ **Mechanical metallurgy**
- ☐ **Metallurgical experiment analysis and evaluation**
- ☐ **Applied ceramics**

(U. S. citizenship required)

To expedite your inquiry, forward one or more copies of your resume, including salary requirement. Please also state your particular job interests. Address Mr. A. J. Scipione, Dept. 43-MFA.

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IN SUNNY SAN DIEGO

Creation of Advanced Research group and expansion of Solar's applied research laboratory have created several excellent career opportunities for experienced metallurgists.

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Research Metallurgists with graduate training or research experience for senior positions in a group engaged in basic studies in such fields as ultra-high strength materials, new methods of joining metals, and high speed deformation of metals.

Research Engineers, Physical Chemists and Metallurgists with experience in light weight, high strength materials as applied to high speed aircraft, missile and space flight problems.

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Solar is a medium-size company (2500 people in San Diego) founded in 1927. It is big enough to offer the most advanced personnel policies, yet small enough for rapid individual advancement and recognition. Salary and performance reviewed semi-annually. Solar is making many significant contributions to advanced technology—in power plant design and production, in manned aircraft and engines, in missile systems and other important areas. Professional status of scientists and engineers is fully appreciated and recognized. A new 60,000 square foot research and engineering building, necessitated by expanding programs, will be completed in 1959.

WONDERFUL LIVING

Solar is located in San Diego—a city which offers the nation's finest year-around sunny climate and unmatched cultural and recreational advantages. And San Diego is rapidly becoming one of the leading research centers of the nation. There are four universities in San Diego, including the new advanced science branch of University of California, where you can continue your studies if you wish. All in all—San Diego living is great!

WRITE TODAY

If you would like to undertake exciting new research projects, while rapidly advancing your career, send a resume of your qualifications to Louis Klein, Dept. E-405, Solar Aircraft Company, 2200 Pacific Highway, San Diego 12, California.

SOLAR AIRCRAFT COMPANY — SAN DIEGO, DES MOINES

Metallurgical Engineers for 18-month crash project on development of foamed aluminum and subsequent work on foamed steel, starting July 15.

Desire project director with record of success in metal process development, and several collaborators. Please state salary expectation and professional references.

Bjorksten Research Laboratories
P. O. Box 265, Madison 1, Wisconsin

POSITIONS WANTED

METALLURGIST: B.S. degree, age 34, veteran, married. Seven and one-half years diversified experience in aircraft and missile fields in product and process control and development work. Thorough knowledge of ferrous and nonferrous materials, including titanium, stainless and ultra-high-strength steels. Michigan preferred. Box 6-45.

METALLURGIST: B.S. degree. Six years experience in both metallurgical and dimensional quality control of forged products. Experience in alloys of titanium, steel, magnesium, aluminum, copper and nickel, and alloys for high-temperature application. Supervisory experience. No location preference. Age 28, married. Box 6-50.

METALLURGIST: B.S. degree, age 34, married, two children. Over ten years experience includes troubleshooting, testing, specifications and failure analysis. Desires materials control and process engineering position. New Jersey, New York, Connecticut or Philadelphia areas only. Box 6-55.

CHIEF METALLURGIST: Seventeen years responsible experience including five years as chief metallurgist and laboratory manager. Strong background in fabricating, martempering, austempering, welding, brazing, corrosion, furnaces and atmosphere generators. Responsible for process surveillance, specifications and standards, consulting on metallurgical problems. Interested in staff position with producer on non-defense products. Box 6-60.

SALES REPRESENTATIVE: Or management. Specialist in nonferrous metals and supplemental industrial product sales to manufacturers. Experienced with both the mill and warehouse level of sales. Located in Wichita, Kans., covers Southwest. Box 6-65.

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or
METALLURGICAL ENGINEER

B.S. with minimum five years manufacturing experience.

Well versed in heat treat techniques and procedures for ferrous and nonferrous metals. Capable of specifying metals and treatment to specific use. Should be familiar with welding, machining and finishing.

Capable of handling metallurgical aspects of oil well equipment manufacturing plant. Location Southwest.

Salary open. All replies confidential. Send complete resume to:

Box 6-130, Metals Review

New problems of unusual interest in the growing field of automation offer outstanding opportunities for

SOLID-STATE PHYSICISTS—To conduct experimental investigations on photovoltaic, photoconductive, semiconductor, thermoelectric, ferroelectric, and ferromagnetic metals and ceramics.

PHYSICAL METALLURGISTS—To work on the melting, brazing, welding, rolling, swaging, powder metallurgy, heat-treating, and metallography of nonferrous and ferrous electrical, magnetic, electronic, high-temperature, and structural materials for instruments and their solid-state sensing devices.

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Industrial Electronics Division

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West Lynn, Massachusetts

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Areas we wish to cover: melting and casting reactor materials, fuel element fabrication, physical metallurgy and irradiation damage.

Write for full information and for the answers to any specific questions to:

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Nuclear Physics
Battelle Institute

505 King Ave., Columbus 1, Ohio

Expanding the Frontiers of Space Technology

Advancement in missile and space technology is highly dependent on metallographic research being conducted at Lockheed today. Special programs include the study of high and low temperature materials, radioactive and toxic materials, pure metals, properties of beryllium and the alloys, and the development of refractory and special-purpose metals, cermets and ceramics.

Studies are also being made of the creep of materials under high temperatures over very short periods – 15 seconds or less; materials testing in hot flow gases; powder metallurgy; metal working and heat treating; high temperature and vacuum techniques; electron bombardment melting; corrosion and gas-metal reactions; gas solubilities in solids; reaction mechanisms at interfaces; impurities and imperfections; deformation; fracture; x-ray and electron diffraction; and diffusion.

Scientists and engineers of outstanding talent and inquiring mind are invited to join us in the nation's most interesting and challenging basic research programs. Write to Research and Development Staff: Dept. F-51, 962 W. El Camino Real, Sunnyvale, California. U.S. citizenship required.

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A NEW ASM BOOK CONTAINING NINE EDUCATIONAL PAPERS ON PRECIPITATION FROM SOLID SOLUTION

NEW DEMANDS UPON METALLURGISTS AND METALS ENGINEERS

"The sputnik age has now thrust new demands upon metallurgists; in many ways the barrier to progress in planes flying faster than Mach 1 is not the sound barrier . . . but the real barrier is that of materials . . . The development of titanium alloys and the research effort expended on molybdenum well illustrate the general point. . . . It is a difficult field; many of the alloys will have 4-5-6 components; understanding their constitution becomes an immensely difficult problem.
We need an Einstein in metallurgy to be able to see into 5 or 6 dimensional space—and some genius—and he would have to be a very great one, to predict what phase constitution in such systems would be, if the fearful amount of the currently necessary experimental work is to be avoided. And we need still another genius to foretell, after all this, how oxidation resistance can at the very same time be provided."

Robert F. Mehl
Dean of Graduate Studies
Carnegie Institute of Technology

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R. S. Busk, Head, Metallurgical Laboratory, Dow Chemical Company

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C. G. Bieber and R. J. Raudebaugh, Research Laboratory of the International Nickel Company

PRECIPITATION IN COBALT-BASE ALLOYS
G. A. Fritzlen, W. H. Faulkner, B. R. Barrett and R. W. Fountain, Members of the Development and Technical Services Department, Haynes Stellite Company

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FOUNDRY SUPERVISOR: Ferrous and nonferrous. Age 40. Foundry tradesman with 25 years experience, 12 years as supervisor. Experience well balanced in production, sand control, cost control, the past 6½ years in valve and fitting production. English by birth, has been in Western Canada for past eight years. Desires responsible position utilizing experience and offering advancement on merit. Will relocate anywhere. Box 6-70.

METALLURGIST: Desires position with manufacturer, research laboratory or service organization, management consultant group. Assignment in engineering management, technical administration or staff assistant is preferred. Position does not have to be limited to above but should be on higher level requiring increased responsibility. Experienced in foundry work, induction melting, casting, ferrous and nonferrous, on supervisory level. Papers, patents. Box 6-75.

METALLURGICAL SUPERVISOR: Eighteen years diversified experience in aircraft and automotive industries. Currently directing activities of 40-man laboratory. Scope of laboratory includes failure investigation, materials selection on development projects, manufacturing problems, vendor surveillance, contract proposals and quality control of incoming materials. Complete resume on request. Salary requirement open for discussion. Box 6-80.

SUPERVISING METALLURGIST: Age 37, graduate, 14 years experience in materials testing, material application and quality control, welding and heat treat control and supervision, last eight years at department head level. Has organized laboratories for two large manufacturers. Desires to relocate, north central or northeast. Box 6-85.

METALLURGICAL ENGINEER: B.S. degree. Eight years experience in vacuum arc melting and reactive metals processing. Desires responsible position with specialty metals producer or investment casting company, preferably in Ohio. Present salary $10,000. Box 6-90.

MANAGEMENT LEVEL METALLURGIST: Knows research, development, troubleshooting. Over half decade experience in management positions in addition to previous top-notch engineering work. Experienced with high-temperature alloys, cast iron, steels, aluminum and reactive metals. Mid-30's, M.S. degree, publications. Box 6-95.

SENIOR METALLURGIST: B.S. degree. Five years experience in specialty and high-temperature alloys. Experienced as chief metallurgist. Age 30, married, veteran, family. Desires position as works manager or technical director. Box 6-100.

SALES ENGINEER—INVESTMENT CASTINGS: Also carbon, alloy and stainless sand castings. Will consider related fields, fabrications or products. Extensively covers New Jersey and greater New York area. Will not relocate. Age 33, married, self-starter, can operate with minimum of supervision. Now in $8000 to $10,000 range on commission. Can produce for reliable concern. Box 6-105.

METALLURGICAL ENGINEER: B.S. degree, age 37. Experience in steel company. Interested in employment in physical or production metallurgy fields, Cleveland area. Box 6-110.

METALLURGIST: B.S. degree, age 32, family. Eight and one-half years experience with same company in all types of heat treating including flame and induction hardening, heat treat specifications, metallography, field failure analysis, production plant problems, magnetic particle inspection, furnace engineering. Seven years supervision with management training. Will relocate for more responsible and challenging position. Box 6-115.

ADAPTABLE METALLURGICAL ENGINEER: With sales personality, seeks sales or sales engineering work which will permit headquartering in Cleveland area. Will travel. Presently employed as sales engineer but available on four weeks notice. Resume sent on request. Box 6-120.

METALLURGIST: Ph.D. degree. Twelve years experience in basic and applied research of nonferrous metals. Fifteen publications in scientific or technical journals, numerous patents in different countries. Familiar with European research. Initiated and supervised investigations in various fields of metallurgy and corrosion. Seeks challenging position in industrial research or at university. Will relocate. Box 6-125.

PYROGRAPHITE SCIENTISTS

Establishment of Raytheon's new Pyrographite Program has resulted in several attractive openings for qualified men:

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- PhD. or advanced degree in chemical engineering, metallurgy or physical chemistry. Will conduct high temperature process studies on a group of interesting materials for missile and commercial applications.
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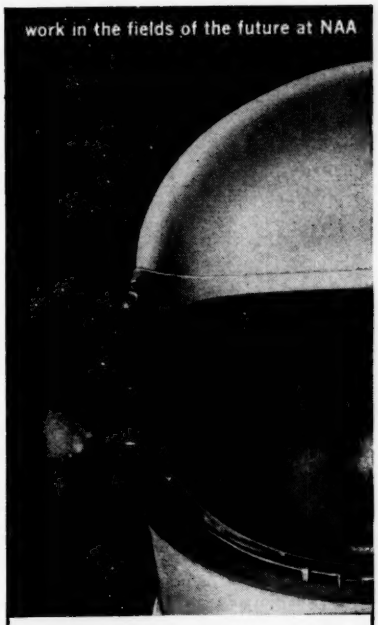
You will enjoy the many advantages of living in the suburban Boston area. Modern benefits. Please send detailed resume to:

W. S. Crowell, Jr.
Raytheon Company
Gore Building
Waltham, Massachusetts

WANTED METALLURGISTS

Opportunity for graduate engineer experienced in furnace operations and quality control of ferro-alloy production, especially chrome, silicon and manganese. Southern locations. Preferred age, in the thirties. Salary open. All correspondence treated strictly confidential. Address reply to:

Walter E. Remmers
President
Pittsburgh Metallurgical Co., Inc.
Box 368
Niagara Falls, New York



PHYSICAL METALLURGISTS

Join one of industry's most progressive teams in exploring the metallurgical frontiers of supersonic flight.

Here are unusual opportunities in applied research for experienced metallurgists who would like to assume increased responsibility and expand their "sphere of influence."

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(Sheet Metal Forming)

For more information please write to: Mr. V. F. Stevenson, Engineering Personnel, North American Aviation, Inc., Los Angeles 45, California.

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chemists, chemical engineers, and metallurgists

Rapid expansion of projects at General Atomic Division has created openings for scientists and engineers, including senior positions. Some of the projects underway are: advanced gas-cooled reactors for land and marine applications, controlled thermonuclear processes, research reactors, nuclear space propulsion and development of new materials.
Please write to Personnel Manager P.O. Box 608, San Diego 12, Calif.

GENERAL ATOMIC
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PHYSICAL AND PROCESS METALLURGISTS

Responsible supervisory position vacancies in Research and Development including Powder Metallurgy, Process Metallurgy and Physical Metallurgy. Supervision will encompass investigations in the areas of alloying, joining, corrosion, slip casting, rolling, forging, extrusion, forming, X-ray diffraction, creep and stress rupture properties, high-temperature tensile testing, fatigue, and others.

If you meet the following requirements:

Have five to ten years experience in Research and/or Development, possess a minimum of a B.S. in metallurgy or preferably a M.S., are interested in an organization with a bright future.

Then write or phone:

Mr. William H. Santschi
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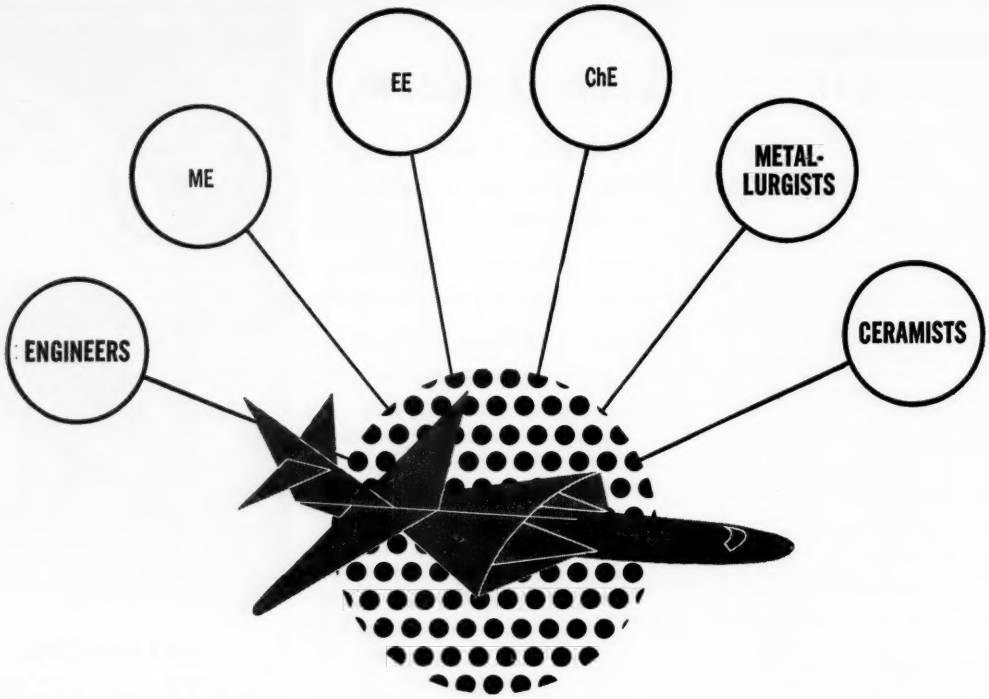
Reading, Pa.



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There are demanding assignments open with General Electric in the development and control of technical production and manufacturing of nuclear components and structures utilizing exotic materials — many of them only laboratory curiosities a few years ago.

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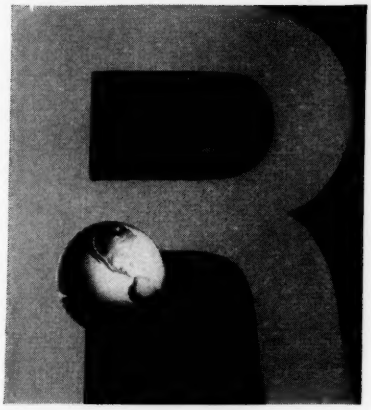

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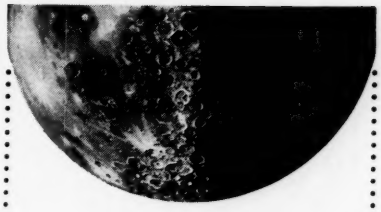

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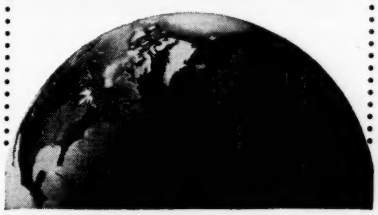

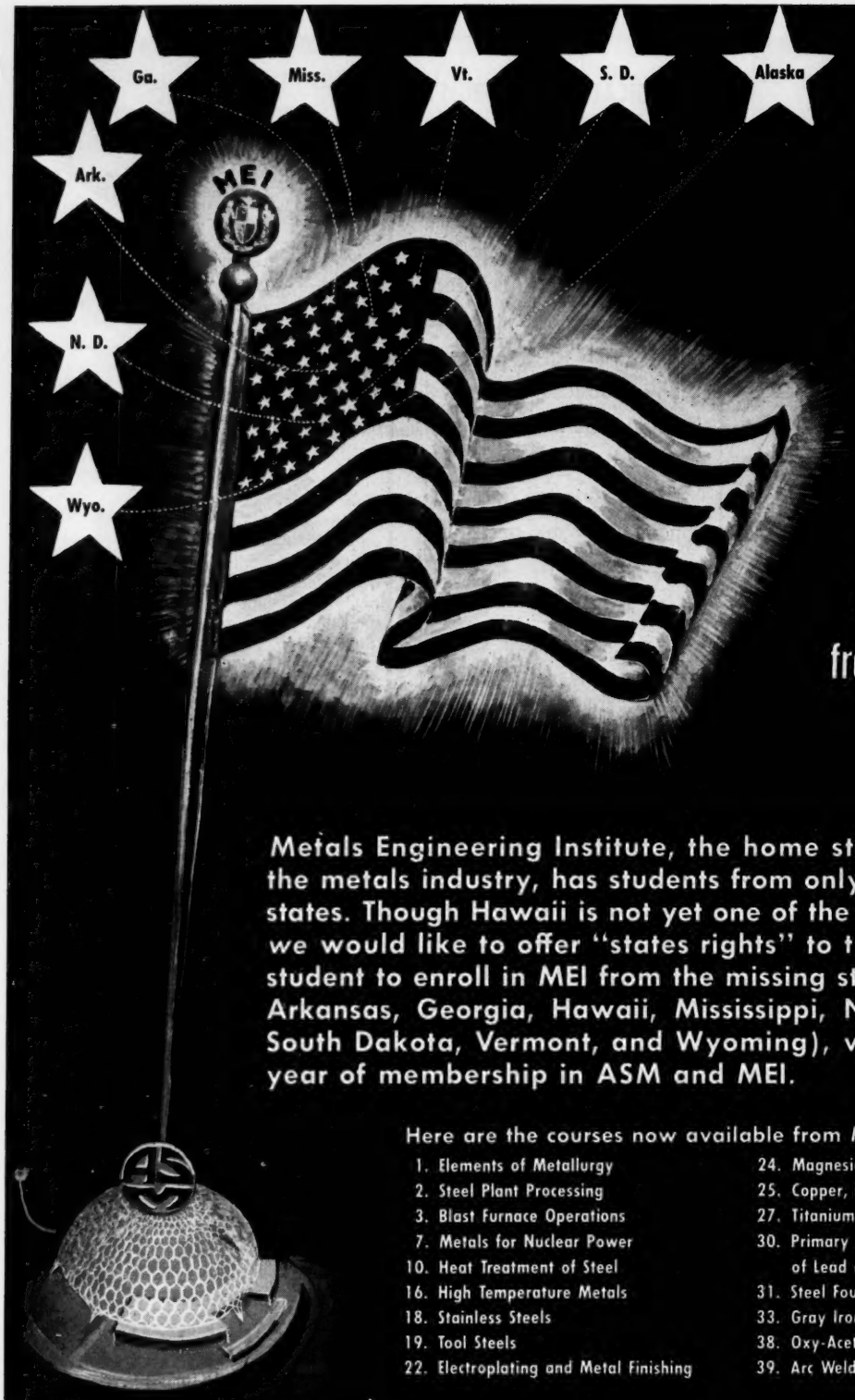

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Physicist John A. Bistline, a graduate of Rollins College (1944), has specialized in High Temperature Critical Facilities at KAPL. He came here in 1948 after receiving his MS in Physics from Cornell. Previously he worked with the Metallurgical Laboratory, University of Chicago, and the Los Alamos Laboratory, University of California. Mr. Bistline is now the physicist in charge of operation of the Proof Test Reactor.

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